SCIENCE AND INDUSTRY

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Highlights Of This Issue

- **Shale and Rock in Deep Cut**
  On the first highway project in Kentucky on which a complete soils survey was made, with definite moisture requirements for placing and compacting the fills, the contractor had one 50,000-yard cut in shale and rock. See page 2.
- **County Roads and Bridges**
  The organization, financing and equipment for looking after the 250 miles of county roads and 601 bridges in Washington County, Ohio, are described in this issue. See page 2.
- **Conn. "Borrows" Road Mix**
  In order to resurface its large highway mileage requiring improvement, and do it on the "pay-as-you-go" plan, Connecticut borrowed the road-mix method with advice from Virginia and has set up a program of low-cost road-mix resurfacing. See page 6.
- **Soil Compaction**
  One of the most important and most widely discussed subjects in the field of construction today is that of the specifications and equipment for soil compaction. Accordingly, a committee was appointed by the A.R.B.A. to study and report on the subject; this report appears in this issue. See page 11.
- **Virginia Route Doubled**
  Because of the amount of traffic on U.S. 211 in Virginia, the Department of Highways last summer doubled the capacity of this 18-foot road by constructing a 22-foot concrete pavement parallel to it, with a 15-foot grass plot separating the two. See page 15.
- **Highway to Alaska**
  Part of the Alaska to Argentina highway project, known as the Pan American Highway, is the route connecting the United States with Alaska. The importance of such a route is now greatly increased because of its aid in the defense of Alaska, and the Alaskan International Highway Commission is now studying, with the Canadian Commission, ways and means of constructing such a highway. See page 24.

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LOYALHANNA DAM

George Vang Constr. Co., Subcontractor on Common And Rock Excavation, Moved Hard Rock in Fast Time

✦ LOYALHANNA Dam, being built in Westmoreland County, Pa., across Loyalhanna Creek about 4.3 miles above Saltsburg, is part of the flood-control project to protect Pittsburgh and other industrial cities below from floods in the Allegheny River and its tributaries. The Great Lakes Dredge & Dock Co. of Chicago, Ill., is general contractor for Loyalhanna Dam, with George Vang Construction Co. of Pittsburgh, Pa., subcontractor on common and rock excavation. Vang hit the hard rock fast, moving as much as 300 to 400 cubic yards in an 8-hour shift in cramped quarters, with tortuous hauling roads for the disposal of the material upstream of the dam.

During the height of the excavation Vang ran three shifts around the clock and then after about six weeks settled down to one 8-hour shift for the clean-up. A 310-cubic foot and a 365-cubic foot Gardner-Denver diesel power compressor furnished air at 110 to 125-pounds pressure for either the Gardner-Denver wagon drill or a pair of Gardner-Denver jackhammers, all using Timken detachable bits. On core-wall drilling the wagon drill ran holes up to 30 feet, while the average straight-ledge excavation was around 6 to 8 feet. The jackhammers were used to drill blast holes from 4 to 8 feet deep in locations where it was difficult to use wagon drills. The character of the rock permitted as much as 6 feet of hole per bit before a change was necessary.

Loading rock at Loyalhanna Dam.

The rock was shot with 40 per cent gelatin Atlas dynamite, using a hand battery for firing. This shot out the rock for easy handling by a Koehring shovel with a 1½-yard Amsco rock bucket loading to a Linn tractor with a 9-yard dump body and a pair of Sterling 10-yard trucks with dual axles giving eight pneumatic tires in the rear. A Cletrac tractor with an 8-foot Gar Wood bulldozer was used to clean up at the shovel and also on the dump.

Personnel

Sam J. Wright was Superintendent for Great Lakes Dredge & Dock Co., Chicago, Ill., general contractor for Loyalhanna Dam, with Jack Farmer as Superintendent in charge of the operations of George Vang Construction Co., Pittsburgh, Pa., subcontractor on rock. The work was done under the direction of the U. S. Engineer Office, Pittsburgh, Pa., Lt. Col. L. D. Worsham, District Engineer, with Ralph Patt, Resident Engineer.

Contractor Used Trucks to Haul Aggregate, Cement and Concrete for 760-Foot Gravity Section Dam

(*Photo on page 52*)

✦ WORK on Loyalhanna Flood Control Dam, a $1,371,710 project, was started October 25, 1939, and is scheduled for completion in February, 1942. This gravity section concrete dam will be 760 feet long, 113 feet maximum height from the stream bed, and will contain 111,000 cubic yards of concrete when completed. The contractor, Great Lakes Dredge & Dock Co. of Chicago, Ill., is relying on truck hauling for all materials for the structure.

Aggregate Delivery

All aggregate is brought in by trucks from the nearest railroad siding, a 3-mile haul over a poor one-way road. The trucks back up to a hopper feeding a Barber-Greene 279-foot belt conveyor 24 inches wide. The belt delivers the aggregate to a 4-compartment bin at the top of the Johnson batching plant where a turnhead makes possible the delivery of the aggregate to the proper bin. When the trucks bring the aggregate faster than can be handled by the hopper feeding the conveyor, they are backed up and unloaded into storage bins which are bulkheaded but not paved. The ma-

(*Continued on page 34*)

Steel Arch Bridge Of Unusual Design

By J. W. CHILDS, Bridge Engineer, New Hampshire Department of Highways

(*Photos on page 52*)

New Structure Replaces Old Covered Bridge Over Pemigewassett River in New Hampshire

✦ ANOTHER example of the "March of Time" in public works construction is the new steel arch bridge spanning the Pemigewassett River at North Woodstock, N. H. This new structure replaces one of the typical old New England wooden covered bridges of the lattice-truss type. This old bridge was a very good specimen of those structures built during the early half of the nineteenth century and had withstood the ravages of time, weather and severe floods for many years until the high water of the hurricane period in September, 1938, washed out its east abutment, with the resulting complete destruction of the superstructure. It was 150 feet in span.

with the narrow roadway deemed sufficient by the builders of that day.

Due to the fact that this bridge is located in the heart of New Hampshire's recreational area, the mecca of thousands of tourist visitors, it was important that consideration be given to architectural beauty as well as utility in the design of the new structure. To accomplish this objective, the type selected is a through steel arch painted a sage green which in line and color blends very well with the surrounding landscape.

(*Concluded on page 20*)

Fairview Bridge, N. H., showing the end connection for the tie cable.

C. & E. M. Photo

Scrapers Move Shale In Deep Rock Cut On Kentucky Project

Rooter and Blasts Prepare Rock for Speedy Removal In 50,000-Yard Cut on a 6.112-Mile Grading Job

✦ A 6.112-mile grading and drainage contract with subsequent bituminous concrete base, binder and surface, was completed during the 1940 construction season by Ralph E. Mills Co. and Woods & Barton, of Frankfort, Ky., from the end of the existing pavement south of Louisa, Ky., to the Johnson County line. This article is devoted chiefly to the removal of some 50,000 yards of material from one cut 2 miles from the north end of the project and the placing of the adjacent fill under the new Kentucky optimum-moisture-content specifications with compaction by sheepsfoot rollers.

This contract is one of the first in this state in which a complete soils survey was made of the materials throughout the entire length of the project, and with definite moisture requirements for placing the fills. The cut in question had 12 feet of sandy loam and clay on top, and then disintegrated shale of variable hardness down to very soft material easily removed by a scraper. A 2-foot seam of coal was met throughout the contract at elevations from just above to just below the subgrade.

C. & E. M. Photo
Rooting soft shale was followed by—

C. & E. M. Photo
Wagon drills on harder ledge before—

C. & E. M. Photo
Placing fill properly sprinkled and—

C. & E. M. Photo
Final compaction with tamping rollers.

Starting the Cut

On the original plans the cut under discussion was to have had a slope of ¼ to 1 in rock and 1½ to 1 in dirt, based on the soils survey. Because of the character of the rock in the upper sections it was necessary to change the slope to ¾ to 1, which meant that considerable additional material had to be taken out so that the 42,000-yard cut became one of 50,000 yards. The cut is about 500 feet in length and has a maximum depth of 56 feet. The top 12 feet of earth was removed by one 15-yard Carryall scraper pulled by a Caterpillar D8 tractor. On the 400-foot haul in starting the cut and adjacent fill, the single scraper was able to move about 2,000 yards a day, but after the rock was reached and a second scraper of the same size was put on, the two scrapers together, in the harder material and with a slightly longer haul, actually moved the same amount of dirt and rock in the same length of time because their capacity was halved.

In the softer portions of the laminated ledge of shale a LeTourneau rooter pulled by an Allis-Chalmers Model L tractor, and working at a depth of about 2 feet, broke up the material as its teeth caught under sheets of it and raised them just sufficiently to break them. This method, however, could not be continued down through the entire depth of rock as the shale became much harder, and after considerable experimenting with both the rooter and with drilling and blasting, the contractor decided to change to blasting as much cheaper in the harder material. The same method of moving with the scrapers was continued.

C. & E. M. Photo
Loading rock at the south end of the Ralph E. Mills Co. and Woods & Barton grading contract with a Lima 602 and Amsco 1¼-yard bucket to one of the fleet of Dumptors.

Drilling the Hard Shale

The contractor used two Cleveland wagon drills drilling up to 24-foot holes, with a driller and helper on each wagon drill. Crusca detachable bits were used on all of the steel. Air for the two machines was provided by two Schramm 315-cubic foot diesel-powered compressors hooked to the same line. The holes were shot with Atlas 40 per cent gelatin dynamite which shattered the rock sufficiently in spite of the laminations to make it easy to load the 15-yard LeTourneau Carryall scrapers when the tractor pulling the rooter was used as a pusher.

On another cut at the south end of the same contract the same drilling outfit was used but the material was loaded by a Lima 602 shovel with a Caterpillar diesel engine and a 1½-yard Amsco rock bucket. Four 6-yard Koehring Dumptors were used to haul the material an average of 500 feet and up to a maximum of 1,500 feet to adjacent fills.

In order to maintain the equipment in the heavy work to which it was subjected, the contractor used a 2-wheel trailer-mounted Hobart electric welder which could be moved rapidly from one end of the job to the other as required by attaching to a towing pin on one of the Ford pick-up trucks.

Making the Fill

Even with the new moisture-content specifications for fills in Kentucky, the material may still go into the fill in 12-inch layers. However, on this contract, the contractor elected to place the earth in layers not exceeding 6 inches in thickness to secure the best results and also to take advantage of the varying moisture content of the material as excavated because it is exceedingly difficult to secure proper compaction and the optimum moisture content in a dry layer of 12 inches in thickness. With the 12-foot overburden of earth, in the 50,000-yard cut at the north end of the job, the contractor had ample earth to cover the rock, particularly when the slopes were laid back at the end of the cut instead of getting all of the earth out at the beginning of operations at this particular point. A minimum of 12 inches of earth is required over all rock fills.

Particular attention was paid to compaction on this job as it is one of the first to be paved the same year the fill was made. Heretofore, all fills have been allowed to rest and compact under traffic for a year before a hard-surface pavement was laid. For this reason an 18-inch layer of earth was placed on the heavy rock fills so that the sheepsfoot roller, which began to be used only last year under Kentucky specifications, would have ample material in which to work and to assure thorough compaction immediately against the rock. Galion sheepsfoot rollers pulled by International TD-40 tractors were used for the compaction, and in order to secure the proper moisture content, two Ford trucks with 860-gallon tanks equipped with sprinkler bars at the rear, were maintained on the job. A 4-inch Novo centrifugal pump was used to fill these tank

(*Concluded on page 48*)

Washington County Roads and Bridges

County in Southern Ohio Maintains 601 Bridges and 250 Miles of Gravel Roads

✦ WASHINGTON County, of which Marietta, Ohio, is the county seat, is the sixth county in area in the state and the fourth in road mileage. It has 1,400.02 miles of state, county and township roads of which 250.37 miles are in the county system directly in charge of the County Engineer, and 896.86 miles in the township system, all work on which is supervised by the County Engineer and the payrolls approved by him. The balance of 252.79 miles is the portion of the state highway system within the county. The county roads are divided into 246.30 miles of gravel-surface roads, 2.63 miles of thin road-mix surfaced roads, 0.83 mile of concrete and 0.61 mile of brick surface.

Organization

The office of County Engineer is an elective office in Ohio, the term being 4 years. The Board of County Commissioners has nothing to do with the roads other than to discuss policy with the County Engineer. Cecil W. Stacy, Washington County Engineer, was elected in 1936 and took office in January, 1937. Prior to that he was Deputy County Engineer, an appointive office, for 8 years, and was an employee of the County Highway Department for 5 years before that.

The county owns a repair garage in Marietta, a galvanized iron building on the outskirts of the city; a wooden storage structure at Masonic Park, about 5 miles from the Court House in Marietta, where obsolete equipment and such materials as calcium chloride, cement and lumber are stored; and then because of lack of storage space elsewhere, it rents six stalls for trucks in Marietta, space for one truck in Barlow, space for two trucks in Deucher, and space for one truck in Watertown.

Financing

All money for the operation of the County Highway Department comes from the portion of the state gas taxes and motor-vehicle license fees which are returned to the county. In 1939, Washington County received $66,000 from state gas taxes and $94,887.19 from the state motor-vehicle license tax. No real estate tax is levied in the county for the support of the County Highway Department, although some of the townships do levy such taxes for work on their roads.

The Road Laws of Ohio, for 1937-38,

(*Continued on page 28*)

C. & E. M. Photo
The county garage and yard at Marietta, Ohio, showing the machine shop at the right.

ACME

Spreading 2-inch TEXACO Asphaltic Concrete wearing surface on runway of the new Millville, N. J., Airport.

One of the TEXACO Emulsified Asphaltic Concrete runways of the Reading, Pa., Municipal Airport.

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Contractors and Engineers Monthly

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Present and Future Construction—Will It Be by Contract or WPA?

More than 565,000 miles of roads have been built or improved by WPA workers during the past five and a half years, according to a recent report by Acting Commissioner Howard O. Hunter of the Works Projects Administration on the activity of WPA during that period.

The mileage of highway and street work by WPA equals nearly one-sixth of the total mileage in the country. Nearly 100,000 miles were built or improved during the last calendar year. The 565,000-mile total is reported to include 41,500 miles of new high-type surface pavement constructed and 29,000 miles improved, and 495,000 miles of other types of pavement and unsurfaced roads built, reconstructed or otherwise improved.

Here is a situation of serious menace to the road-construction industry, both in the present and in the future. There is an equally serious situation in the airport construction field. For example, a report by the President of the Building and Construction Trades Department of the American Federation of Labor indicates that at an air base at Tampa, Fla., WPA handled all clearing and grading at the base, all drainage work, all rough grading on runway and hangar sites, all tunnels and concrete work for the electrical night-lighting system, all road construction at the base, and has obtained a $500,000 project for the construction of two roads leading to the base. In addition most of the buildings, electrical work, installation of plumbing, etc., were handled by WPA.

Granting that the WPA served a useful purpose during the darkest days of the depression, there seems to be little justification for the continuance of such an organization at the present time. Defense construction, of paramount importance to this country, calls for speed, efficiency, and quality of work, and there has been little in the record of WPA to indicate that those requirements have been met on projects constructed by WPA.

The WPA was supposedly organized to make jobs at a time when there were no jobs. That is no longer true. There is not only plenty of jobs; there is actually a shortage of labor in many industries. Unless the Government intends to make the WPA, launched as a temporary expedient, a permanent fixture in our economic set-up, competing with private industry and particularly with the construction industry, there can be no excuse for the increased appropriations going to it to carry on work which could be done better, more economically and quickly and in a more "American way" by contractors. For example, of the $40,000,000 appropriation for CAA airports, about $10,000,000 has gone to the WPA, and the large amount of access road construction, vital to the defense program, is also being carried on as WPA projects.

We must face the danger to construction by contract and face it *now*. If at this time, with plenty of jobs available because of the defense program, the Government feels it necessary to carry on the WPA as a construction agency, what will happen in the post-defense depression which we must inevitably face sooner or later? Experts and planners have already indicated that the most satisfactory and sensible way to offset such a depression is through construction, and plans are being made now for a long-range program of road building to meet existing needs of the nation in order to absorb some of the unemployed. But what good will such programs be if all the work is to be turned over to the WPA and the construction industry joins the other industries facing a period of depression with no prospect of work?

We know that "built by contract" means built economically and efficiently. We must unite in protest against the competition of WPA, a government agency, if the public is to get its money's worth in public works construction and the construction industry continue to make its contribution to the economic life and prosperity of this country.

BRIDGES WINNING A.I.S.C. AWARDS

Peckworth Discusses Report on Equipment For Soil Compaction

(*Report on page* 11)

To the Editor
CONTRACTORS AND ENGINEERS MONTHLY

The excellent article "Economies Possible in Compacting Soils" for the June issue of CONTRACTORS AND ENGINEERS MONTHLY, advance proof of which you sent me, is very common sense and thought-provoking. It recognizes the fact that the practice of compacting soils is intimately tied up with all the equipment used in the process, including digging, transporting, spreading and mixing, as well as compacting. It also recognizes the almost self-evident fact that we compact soil to make it denser. So much emphasis has been put on moisture content that this latter fact is sometimes forgotten.

It is possible to obtain a maximum of compaction with a minimum amount of work at an "optimum moisture content", but it is also possible and sometimes vastly cheaper to obtain the same degree of compaction with more work at moisture contents below or above the "optimum". To do this, one has to use moisture content and equipment as a means to a desired density, instead of conversely using all the phases of modern soil compaction to a desired moisture content. This, of course, is heresy in certain quarters but good hard construction common sense in others, and in saying it I do not wish to be accused of advocating trying to compact soil which is so wet that further compaction is impossible or so dry that excessive pore pressures will be set up when the soil later takes on moisture.

The article also brings out the fact that all traffic over the fill during the compacting process has a part in the final density obtained. The hauling equipment, the bulldozers and road graders which do the spreading, the harrows that mix and process the soil, the tractors that pull the sheepsfoot rollers, all tend to compact the soil. On one occasion, this writer found that earth hauled by rubber-tired equipment, spread by bulldozers and compacted by one pass of the treads of a D8 Caterpillar tractor to a compacted depth of 2 inches gave the same density as the

(*Concluded on page* 47)

"Looks like trouble, Boss!"

A.I.S.C. Announces 1940 Bridge Awards

The thirteenth annual awards for the most beautiful steel bridges built during the preceding year have just been announced by the American Institute of Steel Construction.

The Susquehanna River Bridge between Havre de Grace and Perryville, Md., received the award as the most beautiful monumental bridge (Class A, costing more than $1,000,000); in Class B, costing less than $1,000,000 and more than $250,000, the award goes to the Dunnings Creek Bridge on the Pennsylvania Turnpike in Bedford Township, Penna., as the most beautiful medium-size bridge; the Klamath River Bridge at Orleans, Calif., was selected as the most beautiful small bridge (Class C, costing less than $250,000); and for the fourth class of all movable bridges, the award was given to the Oceanic

(*Concluded on page* 43)

Klamath River Bridge, Orleans, Calif., the most beautiful small steel bridge opened to traffic in 1940.

Susquehanna River Bridge in Maryland, winner of the Class A Award.

Dunnings Creek Bridge on the Pennsylvania Turnpike, winner of Class B Award.

Oceanic Bridge over the Navesink River, N.J., the most beautiful movable bridge.

New Company to Handle Line of Rubber Gaskets

Announcement has been made by the Mechanical Division of the B. F. Goodrich Co., Akron, Ohio, that the newly formed Flexlock Corp. has been given the exclusive distributorship for the patented Flexlock rubber gasket made by Goodrich. T. D. "Duke" Nathan, inventor of the gasket, who has been engaged in sales engineering for the Goodrich Co., is General Sales Engineering Manager for the Flexlock Corp., which has established offices at 411 East Market St., Akron.

The Flexlock rubber gasket is designed so that pipe couplings can be assembled simply and easily in the field and at the same time provides a seal that is not disturbed by any new conditions on the pipe. The gasket, made of either natural or synthetic rubber, is laid over the lip end of the pipe and is provided with a number of circumferential ribs which fold into place when the next section of the pipe is forced over them, locking the two lengths firmly together. The Flexlock gasket is manufactured for sizes ranging from ¾ to 108-inch pipe and can be applied to pipe of any composition.

Paving Without Pavers

The Jaeger method of paving without pavers is described in an illustrated bulletin recently issued by the Jaeger Machine Co., 701 Dublin Ave., Columbus, Ohio. It consists of the use of Jaeger Auto Pavers, truck mixers especially designed for paving contractors, which mix the concrete in transit and discharge while in motion direct to a Jaeger screw spreader. This re-mixes the concrete, spreads and strikes it off in one pass. It is then ready for reinforcing steel or final finish.

This catalog describes and illustrates the construction features of Jaeger Auto Pavers and spreaders and there are many photographs of this equipment in use by various contractors. Copies of this catalog, TMP-41, may be obtained direct from the manufacturer.

Bowman Joins Roebling's Co.

The appointment of Robert T. Bowman as Director of Public Relations for the John A. Roebling's Sons Co., Trenton, N.J., was announced recently. Mr. Bowman has served for the past three years as President of the New Jersey State Chamber of Commerce.

THERE'S A *DIFFERENCE* IN DIESEL ECONOMY!

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The average cost of such fuel is about 2c and more a gallon *below* that of the usual "high-speed" Diesel fuel. In 10,000 hours of operation, therefore, a 100-horsepower "Caterpillar" Diesel can give you *all* the ordinary Diesel savings—with an *additional saving* of approximately ONE THOUSAND DOLLARS!

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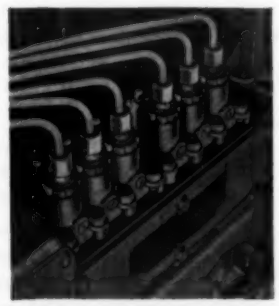
"Caterpillar" Diesel Tractors are available in sizes from 25 to 113 drawbar horsepower. "Caterpillar" Diesel Motor Graders are available in three sizes. "Caterpillar" Diesel Engine sizes range from 34 to 190 maximum horsepower.



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MORE MONEY SAVED HERE!

Follow the yellow line from upper left downward. "Caterpillar" pumps supply fuel under pressure to the injection valve which automatically unseats to shoot an atomized spray of fuel into the cylinder. No mechanical operating adjustments here, either—and another "Caterpillar" precision-built assembly! The design of the injection valve assures continuous conditioning of even the heavier, lower cost fuels which are further prepared for combustion by the pre-combustion chamber. In this chamber (shown below valve) the spray of fuel is changed into a hot swirling gas. The fuel in this gaseous state passes into the cylinder where additional air is available to complete the combustion and the power stroke. The design of this system enables the use of low-cost fuels and assures efficient operation.

CATERPILLAR DIESEL

ENGINES AND ELECTRIC SETS • TRACK-TYPE TRACTORS • ROAD MACHINERY

Connecticut Program Of Road-Mix Surface

Nutmeg State Supplements Subgrade Drainage Program With New Surfacing Based On Virginia Methods

(*Photos on page 52*)

✦ TO resurface the large mileage of Connecticut state highways which had suffered damage from frost boils in the past five years meant the outlay of more money than would be available under its Yankee economy of "Pay as you go". Therefore, some less costly paving was sought which had a good background of low first cost and low maintenance costs. This was found in the Virginia type of road-mix surface, so an engineer was borrowed from the Virginia Department of Highways and plans, methods and contracts set up for the start of a program of road-mix resurfacing.

One of the first highways of the state selected for resurfacing by this method was Conn. 10, the College Highway, running from New Haven through Northampton, signifying Yale and Smith, in case you don't know. A contract for 7.2 miles of resurfacing in the towns of Simsbury and Granby to the Massachusetts border was awarded to Lane Construction Corp. of Meriden, Conn. Work was started August 5, 1940, and completed before the end of October.

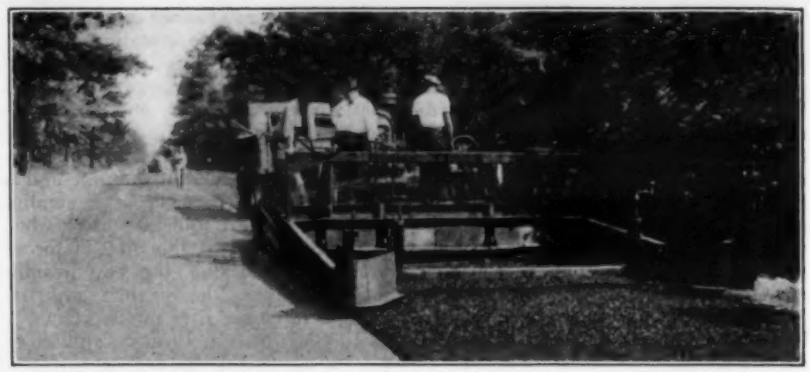
Preparation of Old Road

The old road was a water-bound macadam 20 feet wide with oiled and tar blanket surfaces. The new work widened this to a 24-foot traveled way, except in the center of the Town of Granby where it was widened to 28 feet and a 4-inch bituminous lip curb built as a protection to the grass plots at either side. The old road had a 7-inch crown, necessitating a penetration macadam wedge course on the widening and to take out the crown. Where soft material was encountered in the widening, it was removed and replaced with 12 inches of gravel.

In laying the wedge course, 2 to 2½-inch stone was dumped along the edge and spread with a Caterpillar No. 12 Auto Patrol. The material was then rolled with a 14-ton 3-wheel Buffalo-Springfield roller and penetrated with 1¾ gallons per square yard of 85-100 penetration Shell asphalt, using the contractor's own 1,250-gallon Etnyre distributor mounted on a Mack truck. Immediately following the application of the asphalt ¾-inch stone was hand-cast over this variable-width widening and wedge strip and rolled at once.

Start of Work

Handling traffic on this main highway was no snap for the contractor as in the latter part of August there was a very heavy traffic returning from vacations in the White Mountains of New Hampshire, followed by a reverse traffic to the Eastern States Exposition, an annual glorified county fair at Springfield, Mass., and following that the heavy traffic of students returning to the colleges located on this highway. Interspersed with these peaks of traffic was the regular heavy motor car and truck traffic which is a steady user of this artery. As no detour was provided, all of the work had to be done on one-half of the road at a time and traffic maintained on the other half.



The Jaeger Road Builder mixing the first half of a new road-mix surface on Conn. 10.

For the road-mix a uniform ½-inch screen-size stone was used, requiring a total of 6,700 tons. Inasmuch as the production of uniform-size stone means a large waste at a quarry, supplies were bought from three different quarries

(*Concluded on page 30*)

CUMMER
ASPHALT
PLANTS

Portable Combination Hot and Cold Mix Plants

Portable Hot Mix Plants

Stationary Combination Hot and Cold Mix Plants

Cummer Combination Dryer-Coolers.

Steam Jacketed Mixers 400 to 8000 pounds capacity.

Cummer Internal Fire Dryers

Electric Batch Timers

THE F. D. CUMMER & SON CO.

Euclid and 17th, Cleveland, Ohio

THE WHEEL-BEARING LUBRICANT

FOR YEAR ROUND USE

NEVER BEFORE have operators of buses, trucks and other heavy-duty equipment been offered such a wheel-bearing lubricant.

It is called *TEXACO MARFAK—HEAVY DUTY*, and gives you these 2 great new benefits:

1. **It lubricates in spite of sizzling summer heat and below-zero winter cold**
2. **It stays *IN* wheel bearings and *OFF* brake linings.**

Never before have you been offered a wheel-bearing lubricant with so wide an operating temperature range . . . *Texaco Marfak—Heavy Duty* doesn't cake, harden, change in texture or thin out excessively at high temperatures, nor stiffen up as rapidly in cold.

Because of this, *Texaco Marfak—Heavy Duty* stays *in* wheel hubs and *off* brake linings, thus assuring greater safety in long down-grades.

The outstanding performance that has made Texaco preferred in the fields listed in the panel has also made it preferred on many of the larger construction jobs throughout the country.

These Texaco users enjoy many benefits that can also be yours. A Texaco Lubrication Engineer will gladly cooperate . . . Just phone the nearest of more than 2300 Texaco distributing plants in the 48 States, or write:

The Texas Company, 135 E. 42nd Street, New York, N. Y.

THEY PREFER TEXACO

★ More buses, more bus lines and more bus-miles are lubricated with Texaco than with any other brand.

★ More stationary Diesel horsepower in the U.S. is lubricated with Texaco than with any other brand.

★ More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.

★ More locomotives and cars in the U.S. are lubricated with Texaco than with any other brand.

★ More revenue airline miles within the U.S. are flown with Texaco than with any other brand.

Texaco Dealers invite you to enjoy FRED ALLEN in a full-hour program every Wednesday night. CBS, 9:00 E.D.T., 8:00 E.S.T.; 8:00 C.D.T., 7:00 C.S.T.; 9:00 M.S.T.; 8:00 P.S.T.

TEXACO Lubricants and Fuels

FOR ALL CONTRACTORS' EQUIPMENT

'Dozer Methods Described In New Illustrated Folder

The use of Angledozers and bulldozers, from clearing to final finishing, is graphically illustrated in a new 8-page folder recently issued by R. G. LeTourneau, Inc., Peoria, Ill. Job methods used by well-known contractors throughout the country are illustrated and described, and the design and features of the 'Dozer, claimed by the manufacturer to increase production and lower operating costs, are shown on two full pages.

Copies of this new booklet may be obtained by writing direct to the manufacturer and asking for Folder A-18.

Safe Sling Practice

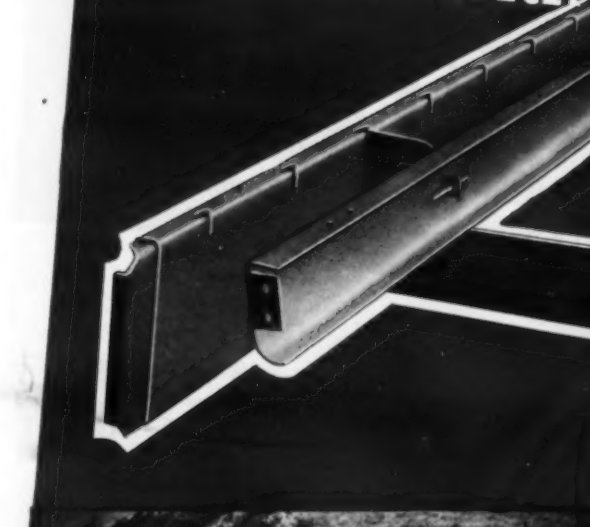
The Macwhyte Co., Kenosha, Wis., has recently issued reprints of an article by J. M. Garris, Manager, Sling Department, Macwhyte Co., entitled "Safe Sling Practice." The various kinds of slings, manila rope, chain and wire rope and the advantages of each for certain types of work are covered in detail, and there are several valuable tables. Table No. 1 is called a "Composite Sling Chart" and gives three safe load ratings each for Atlas 8-part slings, Monarch slings, iron chain slings and manila rope slings in ten popular sizes. A "Sling Load Chart" illustrates the variation of stress on one sling leg when applied to a constant 1,000-pound load at various angles. Other drawings show common types of hitches, including right and wrong methods.

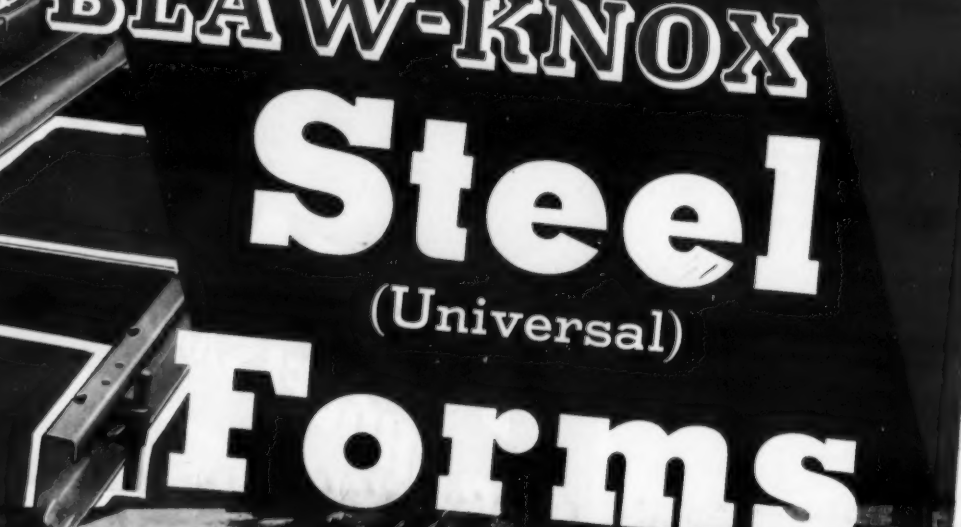
Copies of this informative article may be obtained by writing direct to the Macwhyte Co. and mentioning this item.

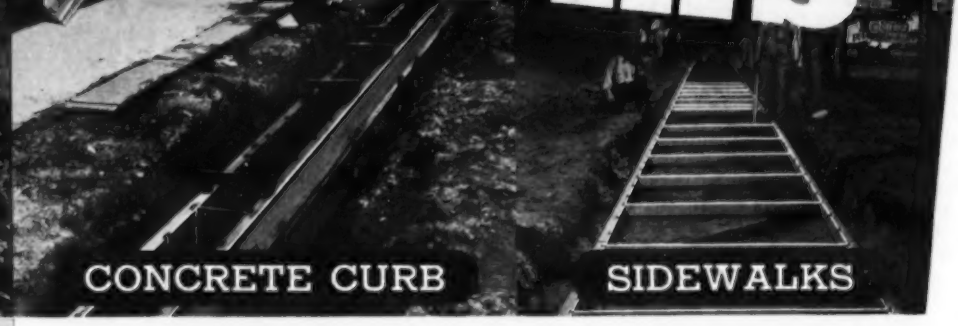
New Maxim Sales Office

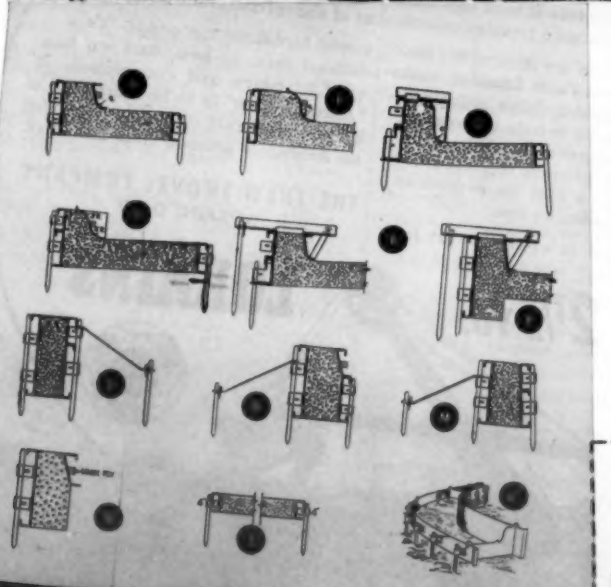
The Maxim Silencer Co., Hartford, Conn., announced recently the opening of its new Mid-West Sales Office, Room 1222, 228 No. LaSalle St., Chicago, Ill. William A. Damerel will be in charge.

FAST...LOW COST STREET PAVING WORK with BLAW-KNOX Steel (Universal) Forms









BLAW-KNOX CONSTRUCTION EQUIPMENT includes:
Bins & Batchers • Road Forms • Street Forms • Concrete Spreaders
Tamping Rollers • Vibrators • Concrete Buckets
Clamshell Buckets • Truck Mixers • Striping Machines • Turntables
Road Finishers • Steel Forms

From cantonments and modern defense building with miles of paving, to the occasional paving job, BLAW-KNOX STEEL FORMS give a high dollar return value to any contractor.

Easy to handle and use, they will do street paving work quicker and cheaper. The steel imparts a smooth finish to the concrete, eliminating hand finishing.

Thousands of contractors use Blaw-Knox Steel Forms for a great variety of work. Any design of concrete curb; curb and gutter; integral curb; sidewalk, etc., can be handled with standard Blaw-Knox form set-ups.

Blaw-Knox Steel Forms are built for long service; quick installation and dismantling; and are rigidly braced to hold their position when being filled with concrete.

Always ready for action — to use again and again.

BLAW-KNOX DIVISION of Blaw-Knox Company
Farmers Bank Bldg., Pittsburgh, Pa.

Send Prices on _____ Lineal Feet of

Send a Copy of Blaw-Knox Catalog No. 1527 ☐ Set-up _____
(A, B, C, Etc.)

Company _____

Individual _____

Address _____

City and State _____

The new 21-cubic yard bottom-dump Euclid.

Larger Earth Hauler Added to Euclid Line

The new and larger self-powered bottom-dump earth hauler recently announced by The Euclid Road Machinery Co., Cleveland, Ohio, has a struck-measure capacity of 21 cubic yards and a heaped capacity of 26.5 cubic yards at a 2 to 1 slope. Other Euclids of this type have struck-measure capacities of 9, 13 and 18 cubic yards.

Powered by a Cummins 200-hp diesel engine, this new Euclid is equipped with a Fuller Model 284 fluid coupling, Lipe double 15-inch clutch, and Fuller Model 8-B-860 transmission. It has eight speeds forward, ranging from 2.1 to 23.3 mph at a governed engine speed with full payload, and two reverse speeds. The drive-axle assembly is the Euclid Model 8RA of the full-floating type, the drive wheels ride on large tapered roller bearings mounted on a 7-inch spindle and are connected to the 4-inch drive axles by means of splined hub caps. Optional gear ratios are available where higher speeds are practical. Standard tire equipment includes 12.00-24 14-ply truck-bus front tires and 24.00-32 24-ply traction-tread tires on the drive and trailer wheels.

The trailer hopper is of the Euclid wedge-shaped design and construction, wider, higher and deeper in front so that the center of gravity of the loaded unit is moved forward and downward. This distributes the load on the drive and trailer tires more evenly, increasing stability and traction. Steep smooth sides and unobstructed full-length and width door opening are designed for quicker dumping. The hopper bottom slopes downward to the front to provide more clearance at the rear, and the space between the opened doors is the same front and rear, to eliminate any tendency to drag or form a bottle-neck at the rear of the dumped windrow.

This new Model 5LDT-71W Euclid is equipped with Bendix-Westinghouse air brake power and control equipment. The 26 x 6½-inch brake shoe assemblies on the drive and trailer axles are of Euclid design and manufacture. Steering and traction brakes are air-powered and controlled; opening and closing of the bottom doors is operated by air power mechanism and the Euclid patented Wheel Wind with a control valve on the steering mechanism. The sturdy 3-way universal tractor-to-trailer hitch combined with the large tires is said to give this larger Euclid the same mobility and ease of operation as the small bottom-dump Euclids.

New Type of Hose

Balance, homogeneity and a high degree of flexibility are the features claimed for the new Condor Homo-Flex hose recently announced by the Manhattan Rubber Mfg. Div., Passaic, N. J. According to the manufacturer, the Homo-Flex principle of balanced engineering construction was first applied to conveyor belts. Because of the unusual service and high tonnage records resulting on all types of conveying jobs, Manhattan engineers experimented in applying this principle in the design of hose, and the Condor Homo-Flex hose was developed.

This hose is made in 50-foot lengths on accurate steel mandrels and is available in several types covering a wide variety of service, including air hose, water hose, high-pressure spray hose, and steam hose. It is stated that it is extremely flexible, light in weight, easy to handle, the covers and plies are inseparable, and diameters are uniform.

Further details on this new type of hose may be secured by those interested direct from the manufacturer.

Bulletins on Pumps, Hoists and Engines

The Novo Engine Co., 216 Porter St., Lansing, Mich., has available a folder containing bulletins on the complete line of Novo equipment. It is divided into four sections, Engines, Pumps, Hoists, and Miscellaneous, and under each are several bulletins covering various models, types, sizes and specifications. Under Miscellaneous are bulletins on Novo generator sets, engine-driven air compressors for diesel and gas-engine starting, and the Novo portable blower.

Copies of this folder may be obtained from the manufacturer.

IT'S AN "ALL OUT" JOB
FOR SHOVELS AND CRANES, TOO!
Jefferson Proving Grounds, Madison, Ind.—2 Lorains
Camp Davis, N. C.
10 Lorains
• A pasture becomes an air field almost overnight—an army camp with all the facilities of a small city springs up like magic—huge government arsenals and scores of private plants, which were in the blue print stage a few months ago, are either now in service or fast nearing completion. That's the American way at work, but it calls for moving millions of yards of rock and material, and thousands of tons of steel—and that means a tremendous amount of shovel and crane equipment.
Lorains are in the thick of the defense program. From Trinidad and Bermuda to Alaska, these machines are doing their bit to help contractors meet or beat construction schedules. And the list of projects is increasing daily almost as fast as machines move off the assembly line.
Thew-Lorain is operating at top speed to deliver the goods. It's a difficult task, at best, and we ask your tolerance and cooperation. If "America First" is to be more than a slogan, we must deliver equipment for America's defense first and fast.
THE THEW SHOVEL COMPANY
LORAIN, OHIO
3/8 to 2 1/2 YD.
LORAINS
General Supply Depot, Conley, Ga.

Base Construction On Airport Runways

Careful Selection of Materials and Control During Construction of Prime Importance

By EDWARD A. WILLIS, Associate Highway Engineer, Public Roads Administration

✦ CONTINUING our discussion of airport-runway construction, begun in the May issue of CONTRACTORS AND ENGINEERS MONTHLY, page 7, with a description of the methods of subgrade preparation, this article will be devoted to the methods of constructing base courses.

Blanket Courses

Airport engineers, like highway engineers, are frequently confronted with the problem of constructing a smooth and lasting pavement in areas where good soils are extremely scarce or entirely lacking, and so of necessity they must use what is available for every possible purpose. If laboratory tests correlated with field service behavior indicate that the majority of soils available are unsuitable for subgrades, they may often be used in the construction of embankments or in cuts, providing a layer of suitable material is interposed between them and the bottom of the pavement structure. In highway practice these blanket courses are constructed of the best available local soils or, in rare instances, of imported material. Their purpose is to insulate the unsatisfactory soil and so reduce the amount of moisture-content fluctuation and the attendant volume changes, and to reduce the thickness of the pavement structure from that which would be required if the pavement were laid directly on the poor subgrade.

At the present time, the decision as to the required thickness of the blanket course must be based on the experience and judgment of the engineer, aided in a general way by laboratory tests. Generally speaking, an effort is made to secure as much good soil directly under the pavement as is possible within the limits of economy. A minimum of 6 inches is usually specified and in some cases as much as 3 feet has been necessary to insure satisfactory performance. From 10 to 18 inches are common requirements.

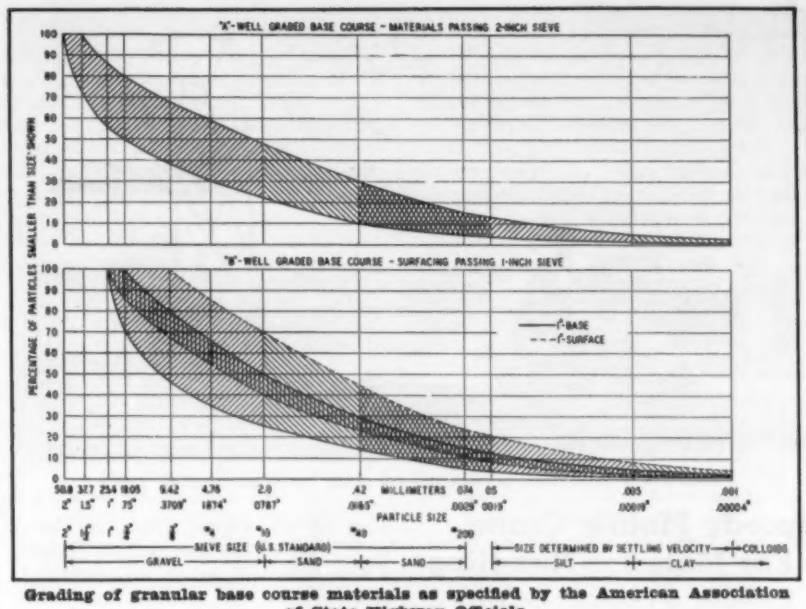
The character of the soil used for blanket courses is such that it will have low volume change, will drain readily, will have low capillarity and will not lose stability when wet. A granular material best satisfies these requirements.

In connection with the use of granular blanket and base courses, it is important to emphasize that they may become reservoirs for the storage of water unless properly designed. The subgrade should be smooth and firm before the granular material is placed on it and should have sufficient crown to insure the transverse movement of all gravitational moisture which reaches it. The blanket and base courses should extend laterally to a point where the water can be discharged either into drains or onto the slope of an embankment. Failure to observe these precautions may result in softening and displacement of the subgrade, or in non-uniform frost heave.

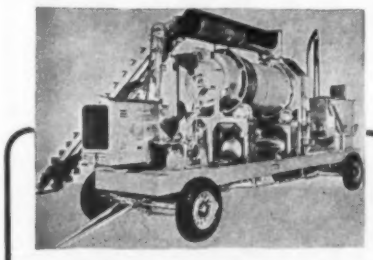
Base Course Design

Materials suitable for granular base courses for thin bituminous wearing courses must have a high stability or resistance to deformation under applied loads under all moisture conditions and must exhibit little or no volume change under changing moisture condi-

(*Concluded on page* 18)



Grading of granular base course materials as specified by the American Association of State Highway Officials.



PORTABLE ASPHALT PLANTS

Write for Catalog

White Mfg. Co.

Elkhart Indiana

Your "GREEN LIGHT" to Greater Profit in '41 . . . .

You travel on a continuous "green light" to profits when you use Worthington Rock Drills, Air Tools and Portable Compressors. You subtract from your expenses and add to your earnings when you take advantage of the cost-cutting features offered by Worthington equipment. Climb on the bandwagon with the ever-increasing number of contractors and maintenance men who are traveling the "MORE WORTHINGTON IN '41" non-stop highway to Greater Profit in '41!

Worthington Features that say "GO":

ROCK DRILLS AND AIR TOOLS

DESIGN: Skilled, scientific designing results in low air consumption, high rate of penetration—and a tool that is easy on the operator.

QUALITY: Forged steel throughout, precision-made parts, and highest skilled workmanship guarantee ruggedness, long life and low maintenance.

SPECIAL FEATURES: In certain Drifters and Hand-Held Drills such exclusive Features as Independent Rotation, Pneumatic Feed and Hole Spotters result in lower cost per foot of rock drilled.

PORTABLE AND SEMI-PORTABLE COMPRESSORS

Worthington Compressors are designed for heavy-duty, low-speed service resulting in maximum overall performance with long life and low maintenance cost. These benefits result from—

- TWO STAGE AIR COOLING
- FEATHER VALVE
- ARTICULATED CONNECTING ROD
- FORCE FEED LUBRICATION
- ENCLOSED CLUTCH
- SEALED CRANK CASE
- UNIT ASSEMBLY
- SIX-CYLINDER ENGINE
- SECTIONALIZED RADIATOR AND INTERCOOLER
- STRUCTURAL STEEL ALL-WELDED FRAME
- ROLLER BEARING WHEELS

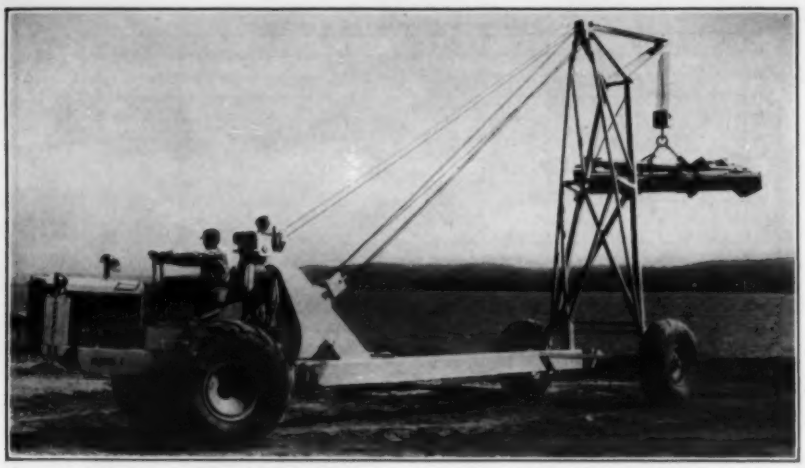
Worthington Wagon Drills, Hand Drills, Heat Treating Machines and Forge Furnaces are proving their ability to cut costs for The Utah Construction Company on the big Nantahala Power Development Project in Andrews, N. C.

There is a Worthington Distributor or Branch Office in your area that will give you prompt local service.

WORTHINGTON

HOLYOKE COMPRESSOR AND AIR TOOL DEPARTMENT

RD1-I HOLYOKE, MASSACHUSETTS



The new Tournacrane is designed for many material-handling jobs.

Speedy Mobile Crane For Material Handling

Unloading and placing pipe, erecting steel, stacking material in supply yards, placing concrete reinforcing on paving jobs, and the handling of similar large, awkward and heavy loads are some of the services rendered by the new Tournacrane on construction jobs.

With boom lengths of 20, 30 and 40 feet and a lifting capacity of 10 tons, the Tournacrane is a speedy unit traveling up to 14 miles an hour, thus shortening travel time between widely separated jobs and extending the working range of the crane. Rubber tires and narrow width make possible fast movement over the highway, and its two-wheel maneuverability enables the unit to work in extremely close quarters and over rough terrain.

One of the features of the Tournacrane is its quick, easy interchangeability with other Tournapull machines, such as Carryalls and Tournatrailers. Only one power-unit investment is necessary to handle lifting, hauling and earth-moving jobs.

Further information on this new Tournacrane may be secured by interested contractors and state and county highway engineers direct from R. G. LeTourneau, Inc., Peoria, Ill., by referring to this item.

Stop-Nut Plant Enlarged

To meet the increased demand for its line of self-locking nuts, the Elastic Stop Nut Corp. has doubled the floor space of its original plant at Union, N. J. One of the construction features of this building, which was erected in 1940, was the use of bolts and Elastic Stop Nuts in the steel construction.

Catalog on Electric Plants

D. W. Onan & Sons, 41-51 Royalston Avenue, Minneapolis, Minn., states in its most recent catalog that there is a standard type or size of Onan electric plant for every conceivable service, from 350 to 10,000 watts. The smallest plants are so light and portable that one man can carry them, and the largest single-unit type of plant can supply power for large industrial or contracting installations where many lights or motors of large capacity will be used. Photographs throughout the catalog show several standard and special models built by this company. There are models for portable, stationary or emergency standby service, in either manual, full-automatic or self-starting types, air or water-cooled. There are 110 or 220-volt AC units, 12, 24, 32 or 110-volt DC units and dual voltage AC-DC units.

Copies of the catalog which describes the electric plants in detail may be obtained by writing direct to the manufacturer and mentioning this item.

High *in* Capacity — Light *in* Weight

BRAND NEW PUMP

New 30M MARLOW Self-Priming Centrifugal Pump; 4 cylinder, 15 hp. LeRoi air-cooled engine. Superlative performance.

MARLOW PUMPS RIDGEWOOD, NEW JERSEY

GOODALL

Belting?

Suppose cover stock, friction, and duck, and design were all the same in every manufacturer's brand of belting . . . There would still be ONE great variable that differs in every factory—WORKMANSHIP.

Mechanical rubber manufacturing is not in the stage where the Man is secondary to the Machine . . . despite modern advancement, it still remains for the men who lay up the fabric, and roll in the sides and cover stock to "make or break" the belt.

In our factory at Trenton father teaches son. We have men who have records of over 60 years' service devoted to our company. Our mill has occupied the same ground since 1873 . . . the scene of over six decades of mechanical rubber development . . . This is what you buy when you specify a belt branded "Goodall Rubber Co., Inc."

Send your inquiry to our nearest branch listed below

GOODALL RUBBER CO.

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RUBBER

DEFENSE SPEED-UP is pushing all types of industrial equipment to the limit of performance. Sustained delivery of full output depends upon *correct* lubrication. For *construction* machinery there are . . .

. . . SINCLAIR SPECIALIZED MOTOR OILS and GREASES designed to keep equipment constantly on the job under extreme service conditions. Sinclair's complete line of lubricants, and fuels, offer you top operating efficiency from your equipment at low maintenance and lubrication costs. For details call the nearest Sinclair office or write Sinclair Refining Company, 630 Fifth Avenue, New York, N. Y.

* * *

(*Left*) **GREENWOOD COUNTY** *Electric Power System, Greenwood, S. C., E. W. Grannis and Lee Construction Co., builders, used Sinclair products for equipment.*

Write for "The Service Factor"—a free publication devoted to the solution of lubrication problems.

SINCLAIR LUBRICANTS-FUELS

SINCLAIR REFINING COMPANY (Inc.)

2540 West Cermak Road, Chicago · 10 West 51st Street, New York City · 1907 Grand Avenue, Kansas City · 573 West Peachtree Street, Atlanta · Fair Building, Ft. Worth

Economies Possible In Compacting Soils

ARBA Committee Report Points to Uneconomical Use of Water and Means Of Consolidating Fills

✦ A REVIEW of the highway industry during the past 15 or 20 years reveals that, in spite of a continued rise in the cost of labor and a general decline in the purchasing power of the dollar, the cost of grading on Federal-Aid projects has continued to decline until the average price bid during 1940 was less than half of the average price in 1922 and 1923. This decline has even greater significance when consideration is given to the increased length of hauls and added requirements for placing and compacting fills during the past 10 years. There can be no doubt that this reduction of cost has been due to the cooperation between the engineer, the contractor or construction superintendent and the equipment manufacturer. Such advances in methods, equipment and management will surely justify the continued cooperation of these groups to the end that the necessary perfection in compacting earth fills may be obtained with the maximum economy.

A progress report of Subcommittee No. 2 on Equipment, Its Application and Uses, of the American Road Builders' Association Committee on Soil Compaction, presented at the 1941 annual convention of the American Road Builders' Association, sets forth some of the observed phenomena in soil compaction, from the standpoint of the mechanical operation and the machinery used, which are of especial interest in establishing further economies. In the past 10 years much engineering thought and experiment have centered on the study of soils, their characteristics and their behavior: 1. under loads; 2. in different parts of an earth structure; 3. under varying moisture and climatic conditions. These investigations have led to the general agreement that the density of any given soil is a gage of its stability, and that most earth fills require some degree of mechanical compaction during construction. There is not, however, a universal accord on the subject of the minimum density that must be obtained for different soil types and on different parts of earth embankments.

It is generally conceded that the maximum degree of density that may be obtained depends upon: 1. the nature of the soil; 2. the degree of pulverizing and mixing of the various constituents; 3. the moisture content; and 4. the thickness of layers in which it is placed as well as the size, type and method of operation of the equipment used in hauling, placing and compacting. It is evident that these factors in their many variations may occur in an almost infinite number of combinations. The inter-relationship of these various elements points to the fallibility of attempting to seek an economic solution of the old problem by investigating only one of the factors.

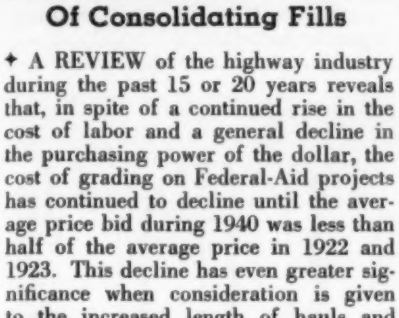
The object of compaction is to obtain a sufficient and a uniform amount of solid material as measured by its dry weight in each cubic foot of an embankment. The chief function of moisture is to act as a lubricant during the compacting process, and the optimum moisture content for a given soil varies with type, size and methods of application of the compacting equipment. It would therefore seem advisable to consider the relative economy of obtaining the required density by various methods, types of equipment and percentages of moisture rather than to restrict, within narrow limits, the amount of moisture in the soil for all methods of compacting. In some places in the arid west a strict adherence to the optimum moisture content, as at present determined, would entail a cost for water alone that would exceed the cost of excavating and placing the earth. In other localities, subject to heavy rains during the working season, moisture control between narrow limits will cause delays that are costly to the contractor and must be provided for in the price bid.

There are three mechanical means of compacting soils: 1. by the application of weight; 2. by impact; and 3. by vibration. The application of weight is most effective in cohesive or slightly cohesive soils where the moisture content is sufficient to render the finer fraction of the soil plastic or semi-plastic. Impact is most effective in somewhat drier soils of this type, and in soils containing a considerable amount of angular rock fragments. Vibration has an advantage over the other methods when compacting cohesionless soils such as sand and gravel. Machines using a combination of two or more of these forces are useful over a wider range of soil types and conditions, but for the purpose of this discussion they may all be considered under the three classifications.

Compaction by Weight

A loose soil mass spread over a considerable area and of a type satisfactory for making a fill will have some supporting power even in a loose state. The amount of this supporting power will depend upon the nature and condition of the soil itself. If a portion of the area is loaded with a weight not to exceed the supporting power of the area of

(*Continued on page 22*)



THE STRONGEST GEARED POWER FOR ITS WEIGHT IN THE WORLD

ALL STEEL HAND HOIST

SEATTLE, U.S.A.

COMPACT—POWERFUL—SAFE

"For use where power is not practical or available"

Manufactured in 2, 5 and 15-Ton Sizes. For capacity comparison, ½" cable used:

2-Ton "Lightweight" ..... 75 ft.
5-Ton "General Utility" ..... 250 ft.
15-Ton Triple-Geared "Special" ..... 1200 ft.

Patent instant gear change and positive internal brake that never fails, and will lock load.

Gear Ratios	Weight	Price, f.o.b. Seattle
2-Ton 4, & 22 to 1	60 lb.	$ 50
5-Ton 4, & 24 to 1	110 lb.	$ 75
15-Ton 4, 19 & 109 to 1	680 lb.	$250

BEEBE BROS.

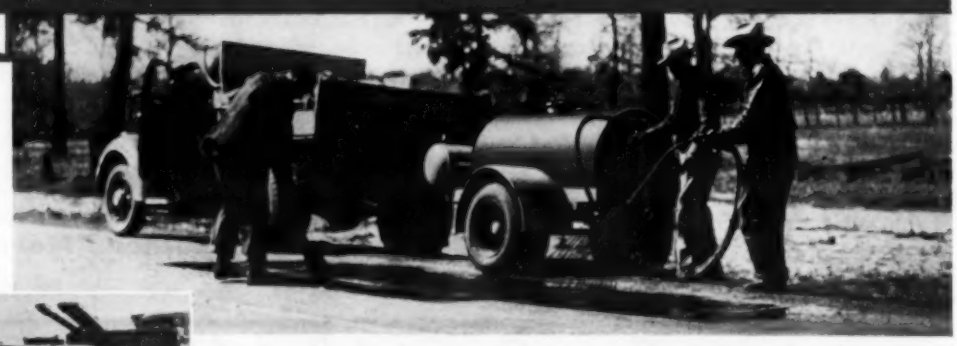
2724 6th Ave., So., SEATTLE, WASH.

Warehouse stocks for dealers' Supply: Seattle—Chicago—Brooklyn—Houston. Complete Literature and List of Dealers in Principal U. S. Cities and Foreign Countries Gladly Mailed.

230-250 Penetration Asphalt THROUGH A 28-FOOT BAR

A 1250-gallon Model 400 pouring OA230 at 375° temperature through a Positive Air full circulating spray bar.

OR R C Material THROUGH A HAND SPRAY



Patchwork with a 200-gallon Model No. 11

A 600-gallon Model SJ doing a short strip of resurfacing work.

● For pouring penetration asphalts or patching the smallest chuck holes—STANDARD STEEL WORKS manufacture a complete line of equipment for every type of bituminous heating and spraying job.

Distributors range from 600 to 2500 gallons capacity—the *only air operated full circulating spray bar on the market*—300-gallon to 800-gallon Maintenance Distributors—Tar Kettles from 10-gallon to 300-gallon capacity with hand or power spray attachments. Write today for the name and address of your nearest dealer.

PRODUCTS

Asphalt Distributors—Tar Kettles—Maintenance Distributors
Street Flushers—Emulsion Spray Units
Asphalt Tools
Asphalt Buckets—Tool Boxes
Tool Heaters—Kerosene and Distillate Burners—Shoulder Rollers.

SALES OFFICES: St. Louis, Mo. Dallas, Tex. Des Moines, Iowa Phoenix, Ariz. Los Angeles, Calif. Atlanta, Ga. Raleigh, N. C. Salisbury, N. C. Fargo, N. D. Chicago, Ill. Albuquerque, N. M. Columbia, S. C. Nashville, Tenn. Omaha, Nebr. Aberdeen, S. D. San Francisco, Calif. Seattle, Wash. Reno, Nev. San Antonio, Tex. Portland, Ore. Denver, Colo. St. Paul, Minn. Jackson, Miss. Springfield, Mo. Oklahoma City, Okla. New York, N. Y. Salt Lake City, Utah New Orleans, La. Little Rock, Ark. Sidney, Mont. El Paso, Tex. Kansas City, Mo. Cheyenne, Wyo. Louisville, Ky. Spokane, Wash. Boise, Idaho

Standard Steel Works

Proper Surfaces for Military Parking Areas

The National Defense Program calls for a considerable number of parking areas for the storage of heavy motorized ground equipment and airplanes. The types of surfaces suitable for moving traffic are not all suitable for the dead storage of heavy military equipment such as heavy-duty trucks, tanks and planes. For example, in a number of locations sand-asphalt construction has been used extensively and very successfully for highways, but due to its tendency to rut under standing traffic, this type of construction is not suitable for parking areas. It is stated that even high-type sheet asphalt is not satisfactory.

Members of the engineering staff of The Asphalt Institute have expressed the opinion that any type of surface employing fine aggregates is unsatisfactory for this purpose and therefore are recommending for parking-area surfacing asphaltic macadam, penetration macadam, and coarse-aggregate asphaltic concrete. The base course may be constructed with fine-aggregate materials, such as sand asphalt, with a 2 or 2½-inch layer of coarse-aggregate asphaltic concrete or asphaltic macadam as a top course.

Where sand or other fine aggregates are available locally and coarse aggregates are not, this may entail some additional expense over the cost of fine-aggregate mixtures, but it is suggested that this expense would not be excessive, the probable difference in the cost of coarse-aggregate wearing courses not exceeding 12 cents per inch of depth per square yard over the cost of locally available fine-aggregate types. Thus the entire additional cost would not exceed 25 or 30 cents per square yard, and a definitely satisfactory type of surface would result. For such work, asphalt cement having penetration of 60-70 is indicated for use in plant-mix asphaltic concrete, and 85-100 for penetration asphaltic macadam.

The Cedarapids MOROK

The New Super-Quarry Crushing Plant

* MEETS THE DEMAND FOR BIGGER CA
EASY PORTABILITY . . . LOWER PRODUC

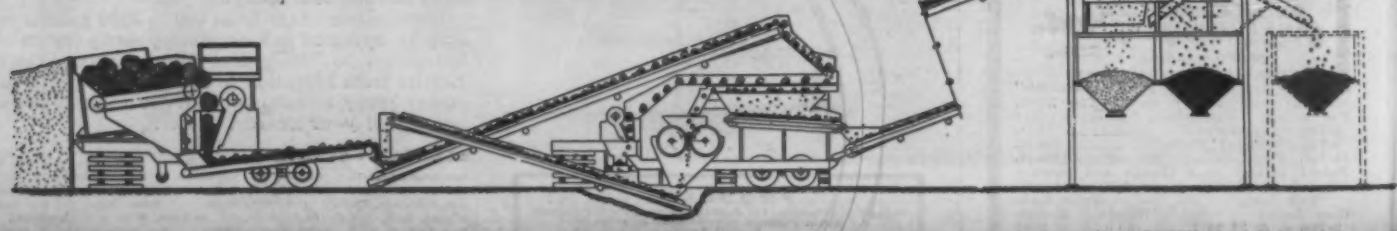
The Cedarapids "Morok", the only plant of its kind in the industry today, meets the demand for big tonnage at low cost. Large construction projects requiring thousands of tons of aggregate must have material without delay. In one operation, from quarried rock to delivery trucks, the Cedarapids "Morok" delivers crushed, screened and graded aggregate at from 150 to 200 tons per hour.

The Cedarapids "Morok" is completely portable. Each unit is mounted on its own tractor-trailer ready to be pulled to the job. Setting-up and dismantling time is reduced to the minimum.

Your Only Competitor Is Another "Morok" Owner!

ALL ELECTRI P

From Quarried Rock to Delivery Trucks
. . . IN ONE OPERATION


DOTTED LINES INDICATE REVERSIBLE CHUTE IN REVERSED POSITION
OVERSIZE DISCHARGE CHUTE
BIN FOR 5TH SIZE MAY BE ADDED WHEN REQUIRED

IOWA MANUFACTURING COMPANY

New Dealer for Complete Link-Belt Speeder Line

The Link-Belt Speeder Corp., 301 W. Pershing Rd., Chicago, Ill., has announced the appointment of Howard-Cooper Corp., Portland, Seattle and Spokane, as distributor for the combined line of Link-Belt Speeder shovels, draglines and cranes, ranging from mobile ⅜-yard units to 3-yard heavy-duty machines. This company has for many years handled the ⅜ to 1-yard Speeder line of crawler and truck-mounted machines. Horace Niles, Link-Belt Speeder district representative, will make his headquarters at the Howard-Cooper Portland office.

Wage and Hour Manual

From the confusing mass of orders, rules and regulations which comprise the "Wage and Hour Law" has been compiled a 1,100-page volume to clarify the social-legislation situation for business executives.

This volume is in three parts, the first containing 17 chapters on the overtime, minimum-wage and other provisions of the Fair Labor Standards Act; the second part deals with the Walsh-Healey Public Contracts Acts and miscellaneous Federal laws regulating wages and hours; while state legislation is treated more briefly in the third part, with digests of regulations for each state.

Copies of the Wage and Hour Manual may be secured direct from the Bureau of National Affairs, Inc., 2201 M Street, Washington, D. C. Price: $5.00.

New Sullivan Dealer

The John Fabick Tractor Co., Gravois and Iowa Aves., St. Louis, Mo., has been appointed sole distributor for the Sullivan Machinery Co., Michigan City, Ind., in southeastern Missouri and southern Illinois, handling the complete line of Sullivan air compressors, rock drills and hoists.

CITY..
N COST

POWER

The Cedarapids "Morok" may be powered by separate electric motors for each crusher screen and conveyor. Electricity may be provided by special generator or from high lines. Switches may be mounted on one panel for centralized control.

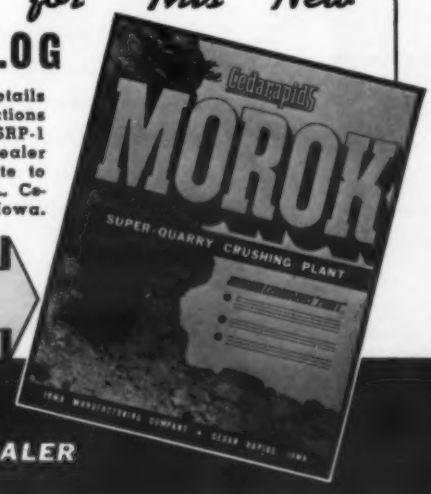
YOU CAN TAKE IT WITH YOU
When You Own a
Cedarapids MOROK

OR DIESEL PLUS ELECTRIC

An alternate power set-up is a combination of separate diesel motors for the primary crusher and the secondary crushers with electric motors for screens and conveyors. A small generator furnishes electricity for these motors.

Send for This New
CATALOG

For further details and specifications get bulletin SRP-1 from your dealer today or write to Iowa Mfg. Co., Cedar Rapids, Iowa.



Cedar Rapids, Iowa . . SEE YOUR CEDARAPIDS DEALER

The Highway Model DD disk spreader attached to a truck backing up and spreading pea gravel over newly applied oil.

Self-Powered Disk Spreads Pea Gravel

The many uses to which a rotary disk spreader may be put are well exemplified by the Model DD spreader made by Highway Equipment Co., Inc., Cedar Rapids, Iowa. This spreader is used to distribute cinders on hillside roads in icy weather, and with one trip will cover the entire width of the road. The material is spread ahead of the rear wheels, permitting the truck to proceed uphill without slipping. This same model may also be used, backing up, to spread pea gravel on a narrow strip of newly applied bituminous material. Thus the oil is thoroughly covered up before the truck wheels go over it, and the spread can be adjusted to any desired thickness by increasing or reducing the speed of the motor. This spreader handles any size material up to and including ¾-inch rock.

The Model DD spreader is equipped with a guard rail to protect the men who are required to ride on the back of the truck, and it is also equipped with guards to protect the spreader itself. It is driven by a 1-hp Briggs & Stratton motor, equipped with a high-tension built-in flywheel magneto, which is moisture and dust-proof. It has a pump and splash system of lubrication. The gear box which is driven by the motor is equipped with steel bevel gears, and a ¾-inch shaft drives the pinion gear. The ring-gear shaft is 1 inch in diameter and drives the distributor disk. The feeder hopper is of 10-gage steel and is fabricated by electric welding. The fins on the distributor disk are 1⅜ x 3/16-inch angles and are easily replaced.

Complete information regarding the Model DD spreader, as well as the Highway mechanical under-body blade, will be found in the latest literature of this company which will be sent promptly to those mentioning this item.

Secondary Crushing Plants

The Pioneer 54-V plant is a secondary crushing plant incorporating a large 54-inch roll crusher, a vibrating screen, and a return belt conveyor system, all mounted on one truck. The 42-V plant is similar in design and purpose, but includes a 40-inch roll crusher.

Both of these plants, which are designed to operate either in quarry, rock or gravel, are described in detail and illustrated in a new folder, Form No. 534, recently issued by the Pioneer Engineering Works, 1515 Central Ave., Minneapolis, Minn. Copies may be obtained by writing direct to the manufacturer and mentioning this item.

New Link-Belt Vice Pres.

Link-Belt Co., Chicago, Ill., has announced the election of Ralph M. Hoffman as a Vice President to direct and supervise sales for the company. Mr. Hoffman, a mechanical engineer, joined the Link-Belt organization in 1923 as Manager of its Seattle Branch. Since then he has served in various capacities and in January, 1940, was made Assistant to the President, with headquarters at 307 N. Michigan Ave., where he will continue to have his office.

DRAG-BRUSHES
ALL SIZES AND MATERIALS
ATTRACTIVE PRICES
ROTARY-BROOMS
NEW OR REFILLED
THE JOSEPH LAY COMPANY, INC.
PORTLAND *Since 1876* INDIANA

EQUIP YOUR ASPHALT PLANT
with a
MADSEN PUG MILL

MADSEN mixers have a reputation for longer life and faster operation. They mix and discharge faster. Mixer wearing sections and paddle tips made of high-test white iron. Broad-faced steel cut tooth timing gears. Mixer shafts of high tensile steel and real built-in value assure the operator of the lowest possible operation cost. Horse-power requirements are low because these mixers are scientifically designed.

500 lb.—1000 lb.—1500 lb.—2000 lb.—3000 lb.—4000 lb.—and 6000 lb. capacities.

The MADSEN PUG MILL is the one you need on your job.

MADSEN IRON WORKS
HUNTINGTON PARK, CALIFORNIA

For low cost per mile
PICK A FORD TRUCK

MANY BIG FLEET OWNERS run their trucks night and day—carrying capacity loads thousands of miles every week of the year.

They watch costs closely. Because the difference of a fraction of a cent per mile, one way or the other, may mean profit or loss.

These operators buy Ford Trucks because they stand up under the grind and save on running time. They buy them for rapid acceleration, for easy handling in traffic and for high speed performance. They buy them for low first cost, low fuel consumption and low cost service. Briefly, *they buy Ford Trucks* for the very things you need in *your* trucks, whether yours is a heavy hauling job or light house-to-house service. Ask your Ford dealer for an "on-your-job" test with *your own* loads and *your own* driver.

FORD TRUCKS AND COMMERCIAL CARS

Double-Tracking A Tourist Highway

Hechler Bros. Laid 22-Foot Concrete Paralleling Old Road on U.S. 211 Leading From Washington to Luray

(*Photo on page* 52)

✦ U.S. 211 is a very popular tourist route, running as it does west from the nation's Capital to the internationally known Luray Caverns and crossing the newly famed Sky Line Drive, and auto licenses from nearly every state in the Union may be seen almost every day on this highway. The old 18-foot concrete pavement on this route was not only inadequate but it had seen better days. So a contract was awarded to Hechler Bros. of Highland Springs, Va., for a new 22-foot concrete pavement parallel to the old with a 15-foot grass area between the two.

Improvement in design was very apparent as one viewed the completed portion of the new pavement alongside the old at the westerly end of the project. Vertical curves are no longer sharp breaks in pavement grades but are much more gradual, of longer radius, and the drainage and slope treatment are greatly improved.

Grading and Forms

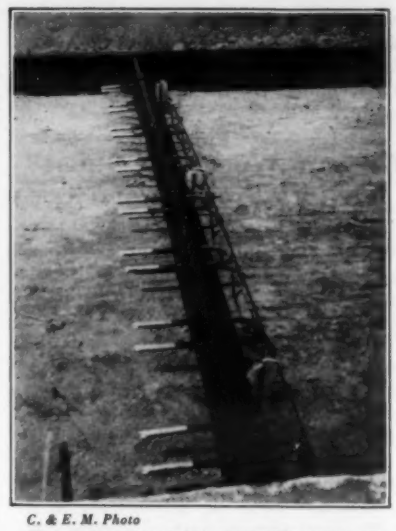
The grade ahead of the forms was prepared by an Allis-Chalmers tractor pulling a Galion grader. This outfit worked on the special subgrade material, spread in depths varying from 6 to 10¾ inches, which underlies the entire length of the pavement. Four men prepared the form trench for the single line of forms required after the first 11-foot slab had been poured. One man was kept busy cleaning the Blaw-Knox and Heltzel 9-inch forms for the two form setters, and two men were used close to the paver lining up and retamping the forms.

The cross section of the 22-foot pavement is 9-7-7-9 inches. The individual slab is 9 inches thick at the outside, reducing to 7 inches in 3 feet, and then remaining uniformly 7 inches thick to the other side of the slab. After the form crew was out of the way, the roughed-in grade was rolled to firmness by a 10-ton Buffalo-Springfield roller and then an R-B subgrader pulled itself over the form and cut the subgrade to exact dimensions. One of the cables for pulling the subgrader ahead was attached to one of the form stakes and the cable on the other side to a tooth of the scarifier on the Buffalo-Springfield roller. Behind the subgrader a hand roller was used for final compaction. The man who straightened the tie bars between the two slabs also oiled the forms ahead of the actual pouring of the concrete.

The Joints

To secure a permanent bond and alignment between adjacent slabs, a keyway was formed in the first slab poured by placing a special form against the road form. This contained a V-shaped projection at mid-height in which one-half of the 2½-foot x ½-inch deformed round tie bars for the two slabs was carried ready to be bent out to straighten the bar and thereby tie the two slabs together. This extra form was held in place against the road form by stakes at intervals of about 2½ feet.

Expansion joints were placed in the pavement at intervals of 90 feet and consisted of ¾-inch thick expansion felt with eight U-bar dowels through the joint material, extending 5 inches on either side. These ⅝-inch dowels were supported on the closed side, which was always placed away from the paver, by two trusses of ¼-inch rods. The two ends of the dowels were painted with red lead and oiled, and then metal caps placed over the ends to provide the expansion volume. The top of the expansion felt was covered with an equal leg cap 2 inches high extending across the entire width of the pavement. Then three extra-heavy special clips were placed over the top of the cap and snugly against the expansion material and held in place firmly by ¾-inch pins so that the expansion joint material was not easily forced out of line, either vertically or horizontally, by the concrete against it.



C. & E. M. Photo

The expansion joint assembly used on Hechler Bros.' 2.4-mile concrete paving contract on U.S. 211 in Virginia.

The contraction joints placed at 30-foot intervals between the expansion joints are identical with them except without the felt. In its place they have a ⅛-inch steel plate set ½ inch below the top of the concrete and contoured on the bottom edge so that it is uniformly 4 inches from the subgrade.

From Batch to Finished Slab

The batching of the aggregates was done at a commercial plant in Washington, D. C., and hauled in a fleet of twenty 3-batch trucks, a round trip haul

(*Concluded on page* 38)

TREE WOUND DRESSING

For destroying and preventing the growth of wood destroying fungi and for the protection of wounds, use Bartlett Tree Paint. Easily applied with ordinary paint brush.

Used by U.S. Government, State Highway Departments. Tree Experts, Parks and Cemeteries.

$1.50 Gal. Can

$5.50 5-Gal. Drum

F.O.B. Detroit

Bartlett Mfg. Co., 3035 E. Grand Blvd., Detroit, Mich.

CONSERVING STEEL while SAVING TIME

★ TRU-LAY PREFORMED WIRE ROPE is helping to conserve the nation's steel stocks by longer service on thousands of projects. TRU-LAY Preformed saves working time by handling easier; it also saves replacement time. Specify TRU-LAY Preformed. You'll get added speed, extra safety, lower costs.

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AMERICAN CHAIN & CABLE COMPANY, Inc.

ESSENTIAL PRODUCTS . . . AMERICAN CABLE Wire Rope, TRU-STOP Emergency Brakes, TRU-LAY Control Cables, AMERICAN Chain, WEED Tire Chains, ACCO Malleable Iron Castings, CAMPBELL Cutting Machines, FORD Hoists and Trolleys, HAZARD Wire Rope, Yacht Rigging, Aircraft Control Cables, MANLEY Auto Service Equipment, OWEN Springs, PAGE Fence, Shaped Wire, Welding Wire, READING-PRATT & CADY Valves, READING Electric Steel Castings, WRIGHT Hoists, Cranes, Presses . . . *In Business for Your Safety*

The new Sullivan wagon drill.

New Wagon Drill and Portable Compressor

Two new pieces of compressed-air equipment particularly applicable to the road-building industry have recently been put on the market by the Sullivan Machinery Co., Michigan City, Ind.

The new Sullivan wagon drill is pneumatic-tired, convenient to handle and drills at any angle. An independent air motor operating the feed gives a wide range of pressures with ample power for pulling steels. The drills are built in light, medium and heavy-duty models, with 4, 6, and 10-foot steel changes. This wagon drill will mount any 55 to 75-pound hand rock drill, increasing drilling footage 50 to 80 per cent over hand operation, according to the manufacturer.

The new Sullivan Zephair compressor is a compact unit mounted on two pneumatic-tired wheels which can conveniently be towed behind a car or truck at regular traffic speeds. It is built for one-man handling and can be operated by the drill runner. The Zephair is built in 105, 85 and 60-cfm sizes, is air-cooled, single-stage, with streamlined air passages, full force-feed lubrication, lifetime main bearings and electric starter.

Copies of Bulletin 87-T on the new wagon drill and Bulletin A-41 on the Zephair compressor may be secured by interested contractors and highway engineers direct from the manufacturer.

A Correction

In the pictorial news section of the May issue of CONTRACTORS AND ENGINEERS MONTHLY were three photographs showing work on Associated Contractors, Inc., contract on the Delaware Aqueduct. These photos should have been credited to R. A. Wurgel.

Army to Work with States In Movement of Troops

Nine regional meetings were held during the month of March in various sections of the country by the War Department's newly formed Highway Traffic Advisory Committee, according to *Highway Highlights*. Plans were worked out at the meetings for facilitating mass movement of troops over the highways at a minimum of inconvenience to civil traffic.

Commissioner of Roads Thomas H. MacDonald is head of the Advisory Committee and the governors of 43 states have already formed similar committees to work with the War Department. Increase in the military use of state highways has already become a problem of traffic officials, and army officials emphasize that the closest kind of cooperation is needed between the military and the public to provide the least possible inconvenience to motorists.

The great increase in army mechanization makes it necessary for many units to take to the highways in the course of their training. The state committees will aid in securing civilian-driver records of men selected to be trained as operators of army motor vehicles, and will also assemble data showing what buses and commercial trucks are available in their sections of the country for use in the mass movement of troops.

Under the proposed plan, army commanders will get in contact with only one official in a state in arranging for large troop movements, and he in turn will make all local arrangements.

Where Speed COUNTS—Compact PROPERLY

with **DAVENPORT SHEEPSFOOT ROLLERS**

Costs go down and your compacting jobs are done more quickly and better when you use modern, stamina-built Davenports. Available in 1, 2, 3, 4 sections. Drop Forged Feet with RENEWABLE Caps. Swivel hitch, rear hitch and cleaners are standard. Varying number of feet to meet any state specification.

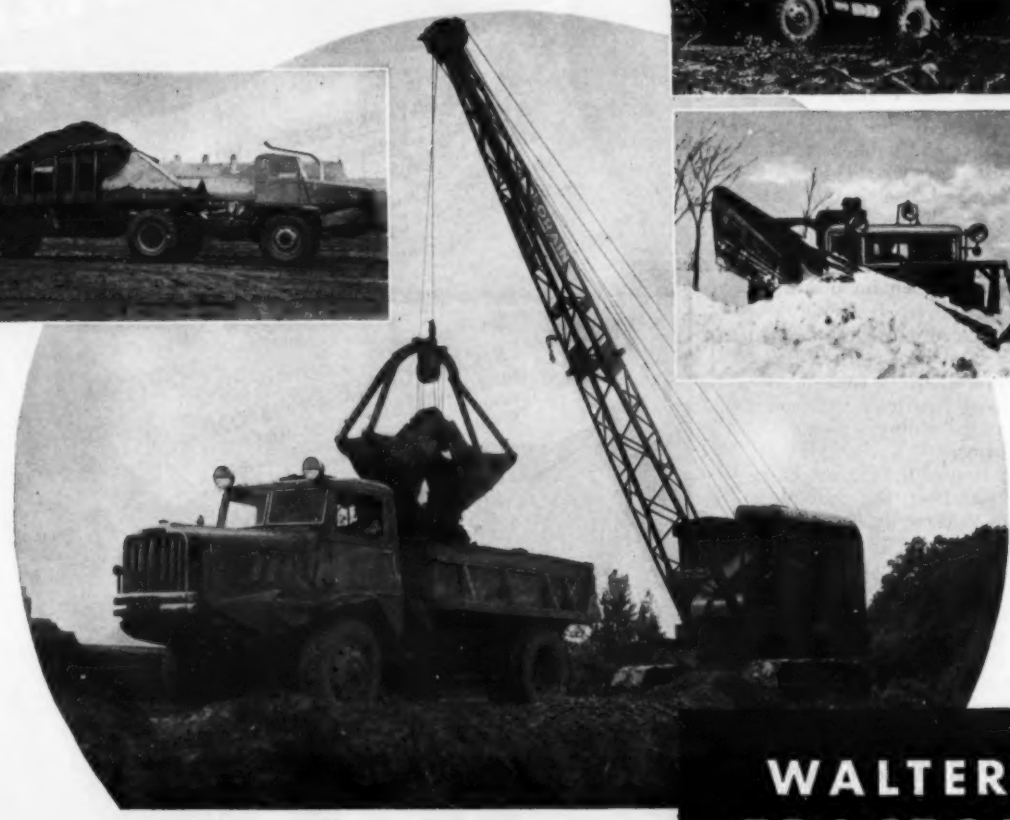
Descriptions and Prices on Request.

DAVENPORT LOCOMOTIVE WORKS, Davenport, Iowa

A Division of Davenport Besler Corporation

4-POINT POSITIVE DRIVE

gives you that extra traction



The more "impossible" your conditions

—THE GREATER YOUR NEED FOR

WALTER TRACTOR TRUCKS WITH

- Torque-Proportioning Automatic Lock Differentials.
- Suspended Double Reduction Drive, with low unsprung weight and high ground clearance.
- Ten to One Range Transmission with five forward speeds of high efficiency. Single Lever Control, giving fast high gear and very powerful low gear, with proper intermediate ratios for all operating conditions.

No destroyer can pinch hit for a battleship. And no ordinary four-wheel drive truck can substitute for a WALTER 4-POINT POSITIVE DRIVE TRUCK. When the going is tough you need not only a powerful motor, but differential action that delivers that power to the wheels according to their requirements. Walter Automatic Lock Differentials and Suspended Double Reduction Drive, accomplish this to the highest possible degree. And if you plan to buy trucks for heavy duty this summer or fall, or for snow removal next winter—better place your order NOW.

Write for Descriptive Literature

WALTER MOTOR TRUCK CO.

1001-13 IRVING AVENUE, RIDGEWOOD, QUEENS, L. I., N. Y.

FOR TOUGH JOBS

GATKE

ASBESTOS

BRAKE LINING CLUTCH FACINGS AND FRICTIONS

Developing *Better* and *Better* Materials to *lick tough jobs* has kept GATKE out in front. Extensive experience with every kind of equipment has taught us the problems and service needs of operators.

Whatever your service, just tell us what you need.

Gatke QUALITY

ASBESTOS PRODUCTS

FRICTIONS - BRAKE LININGS

CLUTCH FACINGS - FABRIC BEARINGS

GATKE CORPORATION, 224 N. La Salle St., Chicago

Van Buren County, Michigan, uses this TD-18 TracTracTor and Austin-Western grader on one of its roads north of Kendall, grading at the rate of ½ mile a day.

Rapid Work Rescues Workman at Shasta

For his presence of mind and rapid rescue work, saving the life of a fellow worker who had been buried alive in a hopper of sand at Shasta Dam, Nestor A. Takala, an inspector for the Bureau of Reclamation, has been awarded the President's Medal of the National Safety Council. The presentation was made at a public ceremony at the Community Park in Toyon, the Government Camp north of Redding, Calif., on May 10.

The award was approved by the Executive Committee of the National Safety Council for Mr. Takala's "presence of mind and skill in performing resuscitation" of B. S. Hodges who was the victim of a cave-in while shoveling sand in a hopper at the Coram end of the 10-mile belt conveyor system which delivers sand and gravel from Redding to Shasta Dam. In a message of congratulation to Mr. Takala, Chief Engineer S. O. Harper of the Bureau of Reclamation said: "You are receiving public recognition of your coolness and presence of mind in saving the life of a fellow man. The medal and certificate are physical tokens of the recognition, but it seems to me the satisfaction you must feel in knowing that you were able to save a man's life through knowledge that you had acquired will be even more lasting than the bronze from which your medal was cut".

The accident occurred last October. Hodges was moving sand toward the discharge gate in the bottom of the hopper which feeds on to another belt in a tunnel beneath the receiving bins at Coram, downstream from Shasta Dam. When the sand slipped, it covered him and carried his body down partly through the gate. Workmen in the tunnel saw Hodges' legs protruding and immediately ran for help. An attempt to rescue him from above by shoveling sand out of the hopper failed.

Hurrying back into the tunnel, Takala and two other workers, George Baze and Mark Whittaker, started to pull Hodges through the gate. They had to do this while the belt was running because to shut off the belt would have automatically closed the electric gate in which the body was stuck. In spite of this hazard, by keeping sand moving down through the gate, the rescue crew finally managed to draw Hodges into the tunnel. He was not breathing when they placed him on the floor.

Takala immediately began artificial respiration by the prone pressure method. His quick action toward resuscitation on the spot, instead of waiting to carry Hodges out of the tunnel, is credited with saving the man's life. After voluntary breathing was restored, Hodges was taken to a hospital, from which he was discharged, completely recovered, 14 days later.

Hodges and Whittaker are employees of Pacific Constructors, Inc., general contractor on the dam, and Baze is an employee of the Columbia Construction Co., gravel contractor. Officials and workers of both companies, as well as of the Bureau of Reclamation, participated in the ceremony at which Mr. Takala was given the award. Representatives of the State Industrial Accident Commission and the U. S. Bureau of Mines were also present.

Ralph Lowry, Construction Engineer of Shasta Dam, said that the circumstances of the accident effectively illustrate the worth of the Bureau of Reclamation's safety efforts. "At Shasta Dam where so many diversified occupations are represented—ranging from laborers to high riggers, iron workers to hoist operators, drillers to truck drivers, high scalers to machinists, shovel operators to electricians,—the value of thorough safety training is especially apparent," Mr. Lowry said. The Bureau of Reclamation maintains a safety engineer on the job and the various contractors also furnish regular safety instruction.

TARPAULINS
ROAD MATS ★
WINDBREAKS

CONTRACTORS' SUPPLY DEALERS in every state sell the Fulton line. Specify SHURE-DRY and FULTEX Tents, Tarpaulins, and Windbreaks—anything made of canvas. Also Fulco Road Mats and Burlap. Fulton products are good and prices are right.

write for prices

If your dealer can't supply you write our nearest plant for catalog samples and price list.

Fulton Bag & Cotton Mills
Manufacturers Since 1870
ATLANTA ST. LOUIS DALLAS
MINNEAPOLIS NEW YORK NEW ORLEANS KANSAS CITY

PMCO
WELDED DIPPERS
have established a new basis for shovel capacity

2-YD. POWER SHOVEL DIPPER
Sizes ⅜ Yd. to 30 Yd.
Payload increases as dead weight decreases—Welded construction eliminates dead weight.

CONSULT your shovel engineer about the added capacity PMCO speed dipper for your shovel. New shovels are now engineered for increased capacity with PMCO welded dippers by leading shovel manufacturers.

REPRESENTATIVE USERS OF PMCO SPEED DIPPERS:

Link-Belt Speeder — The M. A. Hanna Co.
Thew-Lorain — Lima Locomotive Works
Koehring — Ayreshire Patoka Collieries
Harnischfeger Corp. — Oliver Iron Mining Co.
Butler Brothers — Pickands, Mather & Co.
Manitowoc Engineering Works

Check these figures

SOLID CAST DIPPER	EMPTY DIPPER WEIGHT	LOADED DIPPER WEIGHT	NET PAY-LOAD*	INCREASE OF PAYLOAD	INCREASE PER-CENTAGE
⅝ yd.	1350	3035	1685	337	25%
replaces ½ yd.	1600	2950	1350		
¾ yd.	1700	3725	2025	337	20%
replaces ⅝ yd.	1900	3590	1690		
⅞ yd.	1900	4250	2350	337	16⅔%
replaces ¾ yd.	2450	4475	2025		
1 yd.	2100	4800	2700	675	33⅓%
replaces ¾ yd.	2450	4475	2025		
1¼ yd.	2600	5975	3375	675	25%
replaces 1 yd.	3250	5950	2700		
1½ yd.	3100	7150	4050	675	20%
replaces 1¼ yd.	3800	7175	3375		
1¾ yd.	3700	8425	4725	675	16⅔%
replaces 1½ yd.	4250	8300	4050		
2 yd.	4100	9500	5400	675	14⅓%
replaces 1¾ yd.	4700	9475	4725		
2¼ yd.	4450	10525	6075	675	12½%
replaces 2 yd.	5500	10900	5400		
2½ yd.	5000	11750	6750	675	11%
replaces 2¼ yd.	6000	12075	6075		
3 yd.	6200	14300	8100	1350	20%
replaces 2½ yd.	7500	14250	6750		
3½ yd.	8000	17450	9450	1350	16⅔%
replaces 3 yd.	9000	17100	8100		
4 yd.	9850	20650	10800	1350	14%
replaces 3½ yd.	10500	19950	9450		
4½ yd.	10500	22650	12150	1350	12½%
replaces 4 yd.	13500	24300	10800		
4¾ yd.	11500	24325	12825	2025	20%
replaces 4 yd.	13500	24300	10800		
5 yd.	12500	26000	13500	1350	11%
replaces 4½ yd.	15000	27150	12150		
6 yd.	15000	31200	16200	2700	20%
replaces 5 yd.	17500	31000	13500		

*Figuring payload at 2700 lbs. per yd.

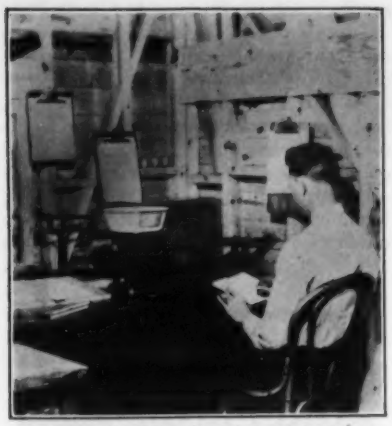
We operate the largest and most complete manganese steel foundry in the United States

PETTIBONE MULLIKEN CORPORATION
Established 1880
4710 West Division Street, Chicago, Illinois

CONCRETE VIBRATORS

Helper wheel as standard equipment on all models. Write for catalog and prices.

Marvel Equipment Manufacturers, Inc.
224 So. Michigan Ave. Chicago, Ill.



A field soils laboratory is a virtual necessity during the construction of a soil-aggregate type base course.

Soils Study Essential On Runway Base Jobs

(*Continued from page 9*)

tions. They consist of natural or artificial mixtures of granular particles such as gravel, stone and sand, well graded from coarse to fine, and a definite but relatively small amount of fine particles such as silt and clay having specific physical properties as revealed by laboratory tests.

The grading requirements for materials for stabilized base courses specified by the American Association of State Highway Officials are shown in the chart on page 9. In addition to these requirements, the specifications state "The fraction passing the No. 200 sieve shall be less than one-half of the fraction passing the No. 40 sieve. The fraction passing the No. 40 sieve shall have a liquid limit not greater than 25 and a plasticity index not greater than 6".

Among the local materials which either meet these requirements or can be made to meet them by the addition of relatively small amounts of soil or soil material are the following: top soil (as found in certain localities in southeastern United States), sand-clay, sand-clay gravel, sand gravel (from stream beds), crusher-run quarry products, blast-furnace slag, limestone, caliche, chert, volcanic cinders, burnt shale and many others of purely local occurrence. The location and utilization of available materials in base-course construction will pay handsome dividends if reasonable care is exercised in the design and control procedures. Many state highway departments learned this through necessity when road funds were scarce. The accumulated experience is an adequate guarantee that the practice is sound from an engineering and an economic standpoint.

Although it is possible to design a granular-type base course for any location, there are many places where this would entail the importation or purchase at a high cost of a large volume of aggregates. The more recently developed methods of stabilizing the fine-grained and less desirable grades of granular soils by the addition of asphalt, either in the form of an emulsion or a cut-back, of tar, cement or other binders, have a particularly important application in the construction of airport runways, as well as in road construction.

Control During Construction

The success or failure of a stabilized base course may well depend upon the control of materials and the construction procedure. This is particularly true where two or more local materials of varying quality are being combined to produce a homogeneous mixture of predetermined characteristics. In such cases a field laboratory becomes a virtual necessity.

The soils engineer on a granular-mix-stabilization job must make frequent tests on the various materials which are the components of the final mixture. These tests include a mechanical analysis to determine the gradings and liquid limit, and plasticity index determinations. From these tests he sets the proportions which will produce a mixture meeting the design requirements.

He should inspect the subgrade for smoothness, crown and stability so that unsatisfactory conditions may be corrected before the base course materials are delivered. He must check the quantities of each material used on the job. After the mixing operations, he must make check tests on the mixed material to determine whether uniformity has been secured to be sure that the desired product has been produced.

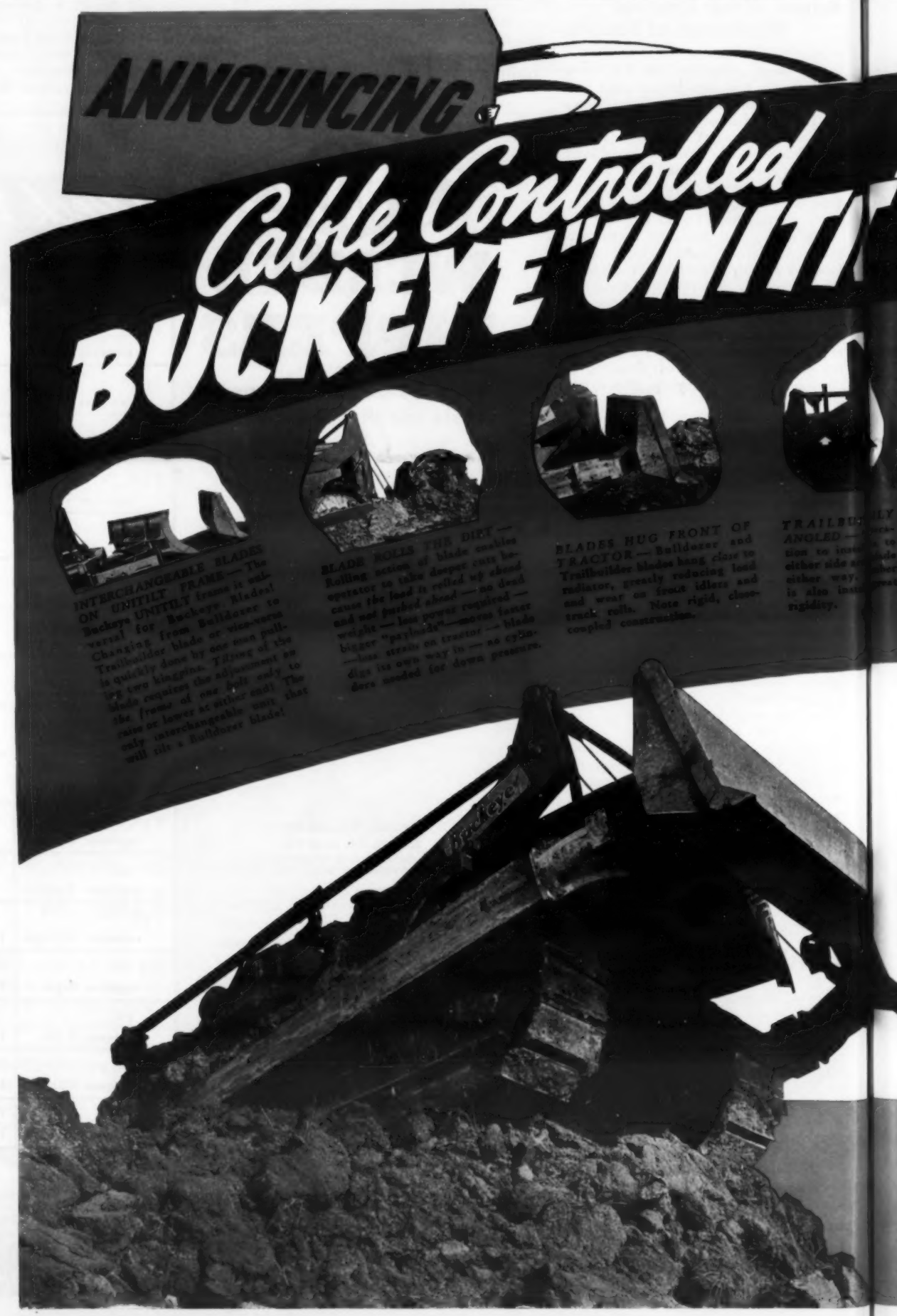
He must make moisture-content determinations and by means of them regulate the amount of water added to assist in the compaction process and, following compaction, he should check the depth of the base course and make density determinations to ascertain whether the required density has been obtained or whether additional rolling is necessary. Finally, he must inspect the condition of the finished base and advise the resident engineer when it is in proper condition to be primed.

Conclusion

The steps for controlling the materials, mix and compaction which have been outlined have been applied with equal success on highway and airport projects. The phenomenal growth during the last five years of the number of engineers employed by state highway departments in inspecting and testing soils for use in all parts of the highway structure demonstrates the practical value of such procedures.

It should be emphasized that, while many highway principles and practices relating to subgrade preparation and base construction have a direct application in airport construction, two are of outstanding importance. They are: first, the selection and use to the best possible advantage of all available soil and soil materials; and second, the production of a greater degree of uniformity through the use of controlled conditions of placement, moisture content and compaction.

From a paper presented at the Thirteenth National Asphalt Conference in December, 1940.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BLADE ROLLS THE DIRT — Rolling action of blade enables operator to take deeper cuts because the load is rolled up ahead and not pushed ahead — no dead weight — less power required — bigger "payloads" — moves faster — less strain on tractor — blade digs its own way in — no cycling needed for down pressure.
BLADES HUG FRONT OF TRACTOR — Bulldozer and Trailbuilder blades hang close to radiator, greatly reducing load and wear on fence idlers and track rolls. Note rigid, close-coupled construction.
TRAILBUILDER ANGLED — ... tion to ... either side ... either way ... is also ... rigidity.
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New Bulletins Describe Breakers and Crushers

Bulletin No. 261-M recently issued by the Smith Engineering Works, 4014 N. Holton St., Milwaukee, Wis., tells the story of Telsmith primary breakers and reduction crushers. Construction features are clearly illustrated and described, and there are tables giving sizes, capacities and general dimensions.

Another new bulletin, No. 265C, is devoted to Telsmith portable crushing plants. According to the manufacturer, the outfits described present no strikingly new features but some new combinations are presented. Various models are described at length and illustrated, complete specifications are given, and there are photographs showing the Telsmith dual portable crushing and screening plant out on the job.

Those interested may obtain copies of these bulletins by writing direct to the manufacturer and mentioning this item.

Oxy-Acetylene Welding and Machine-Cutting Equipment

A revised edition of the booklet, "Opportunities for Profits With Portable Machine Cutting", has just been announced by The Linde Air Products Co., Unit of Union Carbide & Carbon Corp., 30 East 42nd St., New York City. This illustrated booklet describes oxy-acetylene cutting with portable machines, the diversity of operations which can be performed, and a variety of applications. Several new "hints and kinks" on the use of these machines have been added.

This company has also issued as new 12-page illustrated booklet entitled, "What the Purchasing Agent Should Know About Oxy-Acetylene Welding and Cutting Equipment and Processes", which, according to the manufacturer, is designed to help the user or prospective user obtain a clear understanding of the oxy-acetylene process and the various construction and operating features of welding and cutting apparatus used in applications of the process.

Copies of these booklets may be obtained by writing direct to The Linde Air Products Co. and mentioning this item.

Catalog on History of Early Diesel Tractors

In a recent search into the history of the earliest-built Caterpillar diesel tractors, it was found that 24 of the first 25 manufactured are still operating, either as tractors or power units. The case history of these 25 machines, with photographs of each one, is presented in an interesting 16-page booklet recently issued by the Caterpillar Tractor Co., Peoria, Ill. The action pictures are accompanied by a record of the tractor's hours of operation, fuel cost, and wherever possible, maintenance and repair charges.

Copies of this bulletin, Form 6539, may be obtained by writing direct to the manufacturer.

BULLDOZERS and TRAILBUILDERS!

FULL FLOATING BLADE—Side arms pivot at drive end of tractor—free-swinging action up or down for high lift and deep bite of blade. Buckeye cable control gives tremendous power and lightning-fast action!

BALANCED TO UTILIZE FULL TRACTOR POWER—Full lengths of crawlers stay on the ground—no lost traction—maximum pushing power assured—mechanical downward pressure not required—no cylinders for pushing blade down and tipping tractor up.

Use EITHER BLADE on the same Frame

PUSHING POWER APPLIED CLOSER TO CUTTING EDGE!

THE new Buckeye UNITILT design brings you long-awaited improvements in Bulldozer and Trailbuilder construction: You buy *only one* universal frame — use it with all Buckeye Blades! • You get Buckeye's patented tilting device which lets the operator quickly tilt his blade the way he wants it and keep it there! • You reduce the heavy overhanging load on the front of your tractor because the blades are hung so they "hug" the radiator! • You get more out of your tractor because Buckeye *balance* keeps the full lengths of the crawlers *on the ground!* • You get a rigid, rugged frame that will take the battering of the toughest bulldozing without a whimper! • You get Cable Control at its best with Buckeye Power Control Units — smooth, fast action with no jerk on the line, greater lifting power, simplicity and freedom from trouble!

In short, Buckeye UNITILT Bulldozers and Trailbuilders are rarin', tearin', brutes for punishment that'll move *more yardage per day*, push bigger payloads and give you bigger profits on any job! Don't wait to put this up-to-the-minute equipment on your tractors. Write to Buckeye *today!*

BUCKEYE TRACTION DITCHER COMPANY
Findlay, Ohio

Built by Buckeye

Small Steel Bridge Has Unusual Design

(*Continued from page 1*)

Design of Structure

The new bridge has a span of 175 feet from center to center of pins, a roadway width of 24 feet between curbs, with the curbs widened to 2 feet 6 inches to serve as emergency walks. This is ample provision for the few hikers who would use the bridge as well as for motorists leaving their cars because of an emergency and seeking a safe path away from other traffic. The total width of the arch ribs, center to center, is 32 feet 4 inches. The structure was designed as a tied arch in order to obtain vertical reactions at the abutments, this arrangement being necessitated by foundation conditions.

The tie used is a 2½-inch pre-stressed cable. The steel arches were assembled in the shop and measured pin to pin. During erection the tie cable was adjusted to maintain this distance. Thus the arch is made to act as a two-hinged arch under dead load and a tied arch under live load. The hangers are structural shapes, pin-connected at the top and with universal joints at the bottom.

The floor of the bridge is Kerlow open steel grid to lighten the dead weight and also to save the winter maintenance expense involved in snow plowing and roadway sanding.

Personnel

The general contractor for the project, O. W. Miller Co., Inc., Ludlow, Mass., began work on September 12, 1939, and completed the contract on June 18, 1940. The Lackawanna Steel Construction Corp., Buffalo, N. Y., furnished and erected the structural steel. The total cost of the project was $54,923.85. Frank W. Sturm was Resident Engineer for the New Hampshire Department of Highways throughout the construction of the substructure and steel erection.

Method of erecting the steel arches for the Fairview Bridge at North Woodstock, N.H.

New Electric Drill

One of the features of the new Speedway ½-inch electric drill, recently announced by the Speedway Mfg. Co., 1634 So. 52nd Ave., Cicero, Ill., is its new type of natural-grip breastplate handle which, by applying the thrust directly behind the drill point, is claimed to increase accuracy and speed of drilling operations.

The Speedway drill is light enough for portable use, yet heavy enough to withstand production drilling, has a powerful specially-wound high-torque back-geared universal drill motor, with self-aligning oilless bearings, forced air cooling, and a number of other design features. Because of the drill's low load speed it is particularly adaptable for use with carbide drill bits in drilling stone, concrete and similar materials, as well as drilling in steel, iron, wood, etc.

Further information on this new Speedway drill may be secured direct from the manufacturer by mentioning this item.

Avery Farm Machy. Plant Bought By LeTourneau

R. G. LeTourneau, Inc., Peoria, Ill., announced recently the purchase of the Avery Farm Machinery Co. plant which is located adjacent to the present LeTourneau factory in Peoria. The property will add 282,000 square feet of available floor space. Work of moving into the newly purchased plant was started immediately to enable LeTourneau to speed up production of earth-moving equipment by relieving the congestion of the present plant which is hard pressed keeping abreast of equipment orders from contractors engaged in the construction of airfields, cantonments and other defense projects. The new quarters will house the production lines for the manufacture of the Tournapull and of the power control units which supply the power for all LeTourneau machines.

LAYING BLACK TOP?

JAEGER PAVER has 10 ADVANTAGES:

- 18 Ft. Movable Forms Give Smoothness of Concrete,
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Ask also about Self-Leveling 10-12 Ft. Model BP-3, designed for Sheet Asphalt and Hot, Dense Mixes.

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701 Dublin Ave., Columbus, Ohio

JAEGER

THIS SMART OPERATOR SELLS 100% OF HIS PRODUCT

— because his plant can now supply smaller sizes of crushed stone demanded by changing specifications

TELSMITH Intercone Crusher

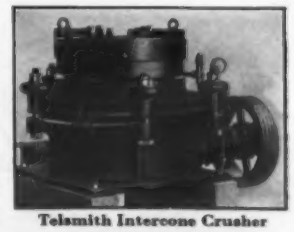
The Crystal Lake Crushed Stone Co., Sheboygan, Wis., found that 20% to 30% of their product went to the stockpile instead of to market. The reason? Changes in specifications had created a market demand for smaller-sized stone. There was little demand for these coarser sizes.

Early in July, 1940, a Telsmith Intercone Crusher was installed. They're selling 100% of their product now. The Intercone is crushing down to the sizes the market uses. It has increased by 50% the plant's capacity for plus ⅛" to minus ⅜" stone chips. The product is finer and better, too. The output of torpedo sand is increased, and its quality improved on account of its larger content of stone particles.

The Intercone has operated on an average of 8 hours daily, crushing minus 1½" to plus ½" Wisconsin moraine gravel. Discharge is set at plus ⅜"; capacity feed, 10 yds. per hr. A 20-hp. motor powers the Intercone. There has been no oil loss; no maintenance. Operating costs here, as everywhere, have been surprisingly low.

In your plant a Telsmith Intercone will *make* money and *save* money for you. And you can buy it at a price—*the lowest for any reduction crusher of equal size.* Get the details in Bulletin IC-34.

In this plant *other Telsmith equipment includes:* Rotary Feeder, 8-A Primary Breaker, 40" x 14' Hercules Gravel Washer, 34' No. 5 Belt Elevator, 28" x 12' Screw Rewasher, 2' x 6' Single Deck Pulsator, 16" x 22' Conveyor.



Telsmith Intercone Crusher

SMITH ENGINEERING WORKS, 3814 W. NORTH STREET, MILWAUKEE, WISCONSIN

Cable Addresses: Sengworks, Milwaukee—Concrete, London

IC-4

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North Carolina Eqpt. Co., Raleigh and Statesville, N. C.
Wilson-Weesner-Wilkinson Co., Knoxville and Nashville, Tenn.
G. F. Seeley & Co., Toronto, Ont.

Diesel Electric Sets and Diesel Engines Described

In a new 48-page catalog, Form 5850, the Caterpillar Tractor Co., Peoria, Ill., has X-rayed its line of diesel engines, and presented a detailed discussion of their mechanical features and manufacturing methods. The various engine parts such as crankcases, crankshafts, cylinder liners, cylinders, valves, timing gears, governors, fuel systems, etc., are accorded sections of the book, and the design and manufacture of each is discussed. Horsepower ratings of the engines are tabulated for each model and complete specifications, dimensions and performance charts are given.

The versatility of the packaged diesel electric power plant is shown in another booklet, Form 6344, recently issued by Caterpillar. In addition to a detailed description of the diesel engine and the self-regulating generator, Caterpillar has listed, discussed and photographed more than a score of different kinds of installations, including machine shops, factories, garages and construction jobs. Dimensions and specifications of the eight sizes of electric sets are given.

Copies of either or both of these catalogs may be obtained direct from the manufacturer by mentioning this item.

New P & H Dealers

The Harnischfeger Corp., 4419 W. National Ave., Milwaukee, Wis., has appointed the Rupp Equipment Co., 2131 Fillmore Ave., Buffalo, N. Y., as exclusive agent for the P & H excavator line in western New York State; Johnson & Dealman, Inc., 255 South St., Newark, N. J. for northern New Jersey, and E. Carl Price, 18-20 Little Britain Rd., Newburgh, N. Y., in Sullivan, Orange and Rockland Counties.

Booklet on Designing Heavy Timber Structures

A new 21-page booklet, "Designing Timber Connector Structures," explaining the application of data contained in the "Manual of Timber Connector Construction" has just been prepared by J. E. Myer, Research Engineer of the Timber Engineering Co., 1337 Connecticut Ave., Washington, D.C. This companion booklet contains information on the types and uses of timber connectors, conditions affecting connector loads, factors influencing connector joint details, methods of computing sizes of structural members, discussion of joints loaded parallel to grain and at angle to grain, formulae for determining stresses in members with combined bending and axial loads. Recommended procedure for designing timber connector structures is given in detail and examples illustrating the necessary steps are included.

Copies of this booklet, including a 4-page pamphlet illustrating the load variations for timber connectors with different end distances, edge distances, spacings, and angle of load to grain, may be obtained direct from the Timber Engineering Co.

MORE FEET OF HOLE PER SHIFT

EASIER HOLDING

LOWER UP-KEEP COST

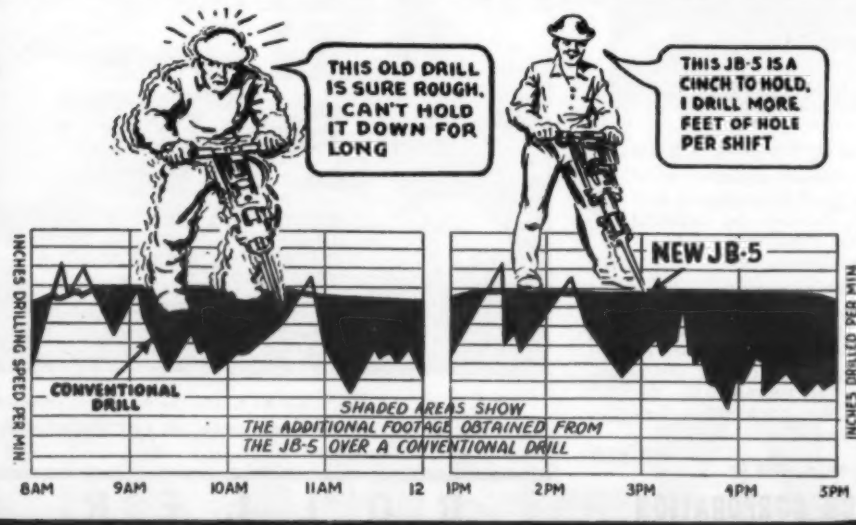
The JB-5

A NEW 55 LB. JACKHAMER

THE Jackhamer is a hand held drill. In operating it, human arms, legs and backs become the mounting—thus a man's size and strength limit the drilling capacity.

In the past, few operators had the strength and endurance needed for top performance of a 55 lb. class hammer throughout the shift. The result was less drilling, excessive fatigue and high upkeep costs.

Today's new Jackhamer, the JB-5 is so designed that the average size man can comfortably handle its full power all day long producing more feet of hole per shift with less upkeep costs. Send for Bulletin No. 2734.


THIS OLD DRILL IS SURE ROUGH. I CAN'T HOLD IT DOWN FOR LONG
THIS JB-5 IS A CINCH TO HOLD. I DRILL MORE FEET OF HOLE PER SHIFT
NEW JB-5
CONVENTIONAL DRILL
SHADED AREAS SHOW THE ADDITIONAL FOOTAGE OBTAINED FROM THE JB-5 OVER A CONVENTIONAL DRILL
INCHES DRILLING SPEED PER MIN.
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8 HOURS DRILLING SHIFT

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Caracas	Madrid	

5-34

Report on Equipment For Soil Compaction

(*Continued from page 11*)

contact, no compression or movement will take place. If this supporting power is exceeded, there will first be a displacement due to the lateral yield of the soil and then a consolidation of the supporting soil. Hence, the load will sink until the supporting soil develops sufficient bearing power to resist further penetration. This increase in streng.h is due to increased density and to the increased lateral pressure of the adjacent soil which has the effect of confining that portion under load. The depth of penetration, or submergence of the load, will depend upon the ratio of the unit pressure of the load to the initial unit supporting power of the soil, and those characteristics of the soil which cause it to build up resistance under load.

Studies of soils of uniform characteristics throughout their masses have proved that when they are subjected to a uniform load over a circular area, the greatest stress occurs at a depth equal to approximately seven-tenths of the radius of the loaded area, and that the stress decreases above and below that point. This rate of decrease is sufficiently gradual for us to consider that a zone of maximum stress exists within the supporting soil, beginning at a depth equal to about four-tenths of the radius of the loaded area, and extending to a depth equal to the full radius. The unit pressure applied to the soil mass below this zone at maximum stress may be of sufficient magnitude to cause further consolidation under repeated loadings.

Other studies of the reactions under uniform loads applied to rectangular areas, where the length of the loaded area is considerably greater than the width, indicate that the unit supporting power of a soil increases as the width of the loaded area increases. This result is much more pronounced in cohesive soils having a high moisture content than in granular soils with a high internal angle of friction.

Similar studies of reactions under moving loads of non-uniform distribution and supported on elliptical as well as rectangular areas would throw additional light on this subject. Without such studies no quantitative data are available but it would seem reasonable to assume that moving loads would produce reactions similar in kind to those of static loads. This would serve to explain the results obtained from the action of those machines which apply relatively low unit pressures over comparatively large areas of contact.

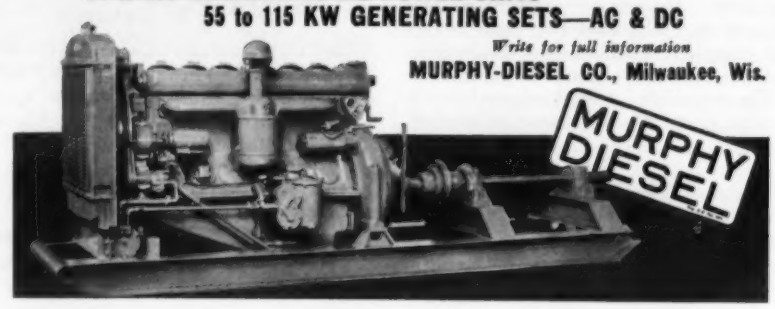
It is the excessive unit pressure and not the total weight that causes rutting or lateral displacement of the surface of a fill. It follows, then, that those machines which apply high unit pressures will disturb, displace, or loosen the soil above the depth of penetration even though they may be effective in compacting the soil below that depth. When the depth of penetration and the amount of displacement of the top layer become excessive, the amount of power consumed in churning the soil may become so great that the operation will be impracticable, or in some cases may become physically impossible. This result is illustrated by the action of weighted tamping rollers and overloaded high-pressure tires on trucks when operating over plastic soils that have a high water content.

Compaction by Road Rollers

Let us consider the ordinary type of road roller consisting of one or more cylindrical rolls by which pressure is applied to the surface traversed. Such machines were originally designed for compacting surface courses and for bases that already had a fairly high supporting power. If, however, they are applied to loose soil and especially to soil that is somewhat plastic, the rollers will push a mound of earth ahead of them until they mire down or otherwise defeat their purpose. If the soil has sufficient bearing power to support the initial trip, the area of the contact strip under the roller becomes narrower with

(*Continued on next page*)

85 to 200 HP ENGINES and POWER UNITS
55 to 115 KW GENERATING SETS—AC & DC



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MURPHY-DIESEL CO., Milwaukee, Wis.

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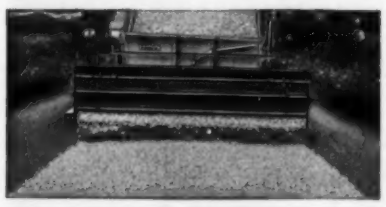

The BURCH FORCE FEED SPREADER will lay a perfect stone mat with its specially designed cylinder which delivers the material uniformly and eliminates all tendency to corrugations.

A dual feed gate control allows instantaneous adjustment of the flow of material and also permits either end of the feed gate to be raised or lowered independent of the other. The machine is operated by the movement of the truck either forward or backward.

Manufactured by

THE BURCH CORPORATION
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Builders of Equipment for 50 Years

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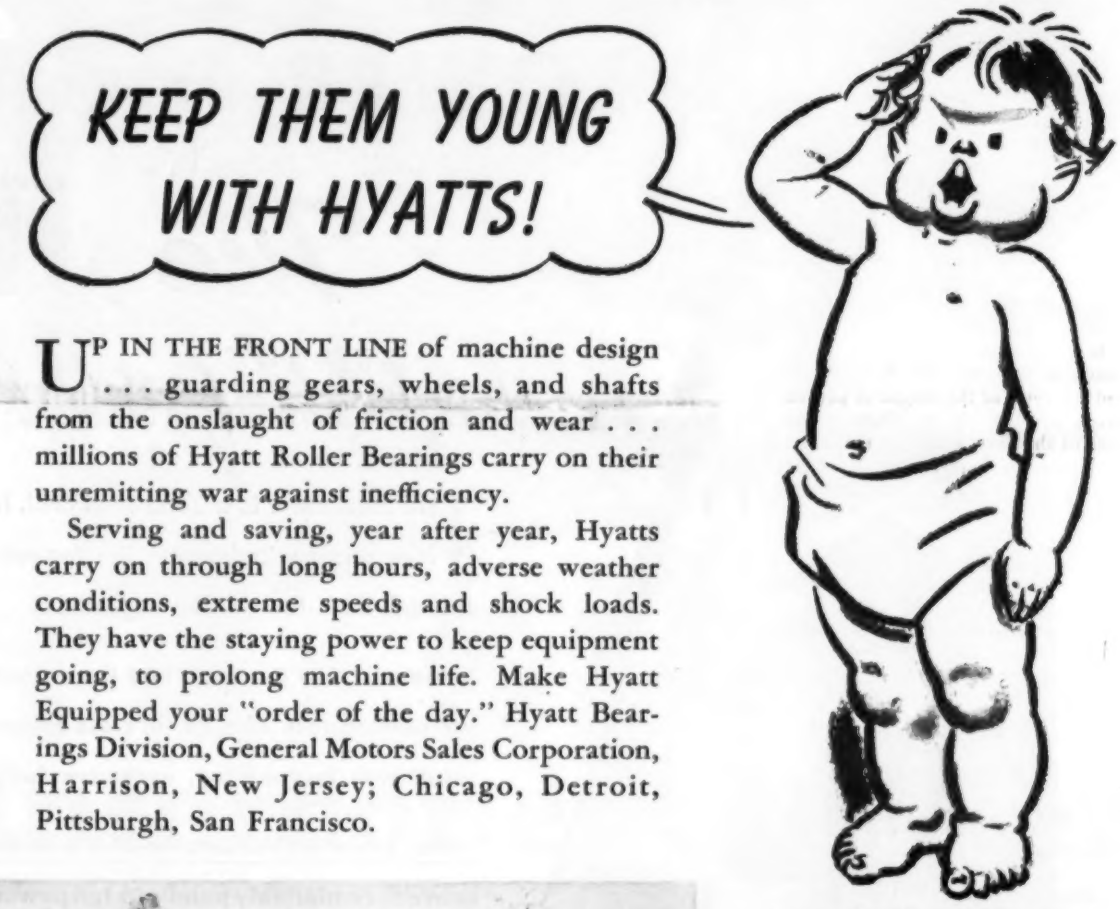
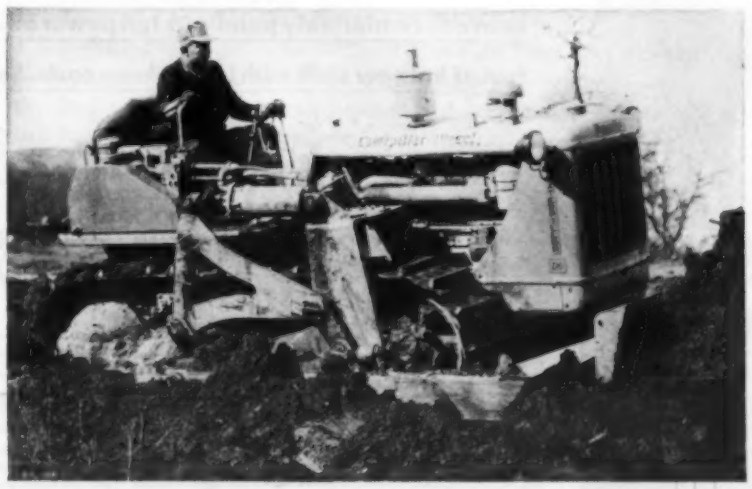
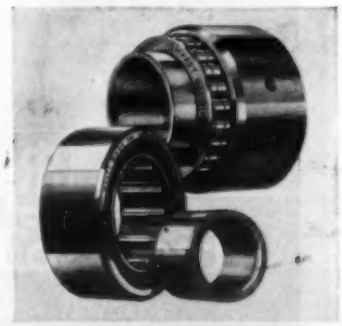


UP IN THE FRONT LINE of machine design . . . guarding gears, wheels, and shafts from the onslaught of friction and wear . . . millions of Hyatt Roller Bearings carry on their unremitting war against inefficiency.

Serving and saving, year after year, Hyatts carry on through long hours, adverse weather conditions, extreme speeds and shock loads. They have the staying power to keep equipment going, to prolong machine life. Make Hyatt Equipped your "order of the day." Hyatt Bearings Division, General Motors Sales Corporation, Harrison, New Jersey; Chicago, Detroit, Pittsburgh, San Francisco.



This new "Caterpillar" Diesel D6 Tractor, like their many other well-known models, includes Hyatt Roller Bearings among its new and valuable design features.



HYATT
ROLLER BEARINGS
QUIET

Effect of Rollers, Tires And Tractors Studied

(*Continued from preceding page*)

each succeeding trip until it approaches a line and the maximum pressure is exerted at the surface. This results in a non-uniform density in each layer with the maximum at the top and the minimum density at the bottom.

Effect of Tamping Rollers

The tamping roller is most generally used for soil compaction in this country, although it is not effective in cohesionless sand or in rock fills. This machine had its inception about 30 years ago in an attempt to imitate the action obtained by running a flock of sheep over a loose fill,—hence the name sheepsfoot tamper. The principal of operation is that as the drum is pulled forward, the feet extending from the cylindrical drum penetrate the soil until bearing power sufficient for support is obtained. If the support obtained by the feet is not sufficient to carry the full weight of the roller the balance is carried on the soil supporting the drum itself. The compression of the soil directly under the feet together with the confining pressure of the adjacent soil helps to develop resistance to penetration. Successive trips build up a dense layer at the bottom which increases in thickness until, on the final rolling, the feet ride on the soil surface. The success of this operation depends upon the type of soil, its moisture content, the thickness of the layers, and upon the design, size and weight of the tamping roller itself.

During the past 10 years much attention has been given to features of design, such as the size and shape of the feet and the ratio of the length of projection from the face of the drum to the diameter of the drum itself, so that there will be minimum disturbance of the top layer of the soil as feet are forced into it and withdrawn. The size and weight of these machines have increased until the pressure of the foot surface has risen from approximately 100 pounds to over 500 pounds per square inch. Specifications have been written determining the number of units that may be pulled behind one tractor and the speed at which they may be operated, but the only thing that seems to have been definitely proved is that no one type or design of tamping roller is equally adapted to all soil conditions.

It would seem that the investigation of the adaptability of tamping rollers to various soil types and conditions would be a fruitful field for further research. Such a study might point to the advisability of increasing either the weight or the number of passes of the tamping roller and decreasing the moisture content below the optimum, as determined by the Proctor test, when compacting some soils or in cases when the cost of water is excessive. More consideration should be given to the relationship between the unit pressure applied by the feet of the tamping roller and the supporting power of plastic soils with the moisture content that is to be required. Attention also should be called to the fact that tamping rollers are generally hauled by track-type tractors and more effort should be made to distinguish between the compacting effect of the hauling unit and that of the tamping roller. There have been cases where no additional density was developed by pulling tamping rollers over earth fills beyond that which would have occurred by pulling the same weight in any other form for the same number of trips.

Effect of Track-Type Tractors

The action of track-type tractors or other track-type machinery will not be discussed at this point. Inasmuch as such equipment involves both the principle of weight and vibration in compacting soil and since the unit pressure is low, this action is discussed later under the heading vibration. One very obvious factor must be considered, however, and that is that hauling and spreading equipment plays a very important role in soil compaction. This may be illustrated by the action of the modern large-sized low-pressure rubber tires.

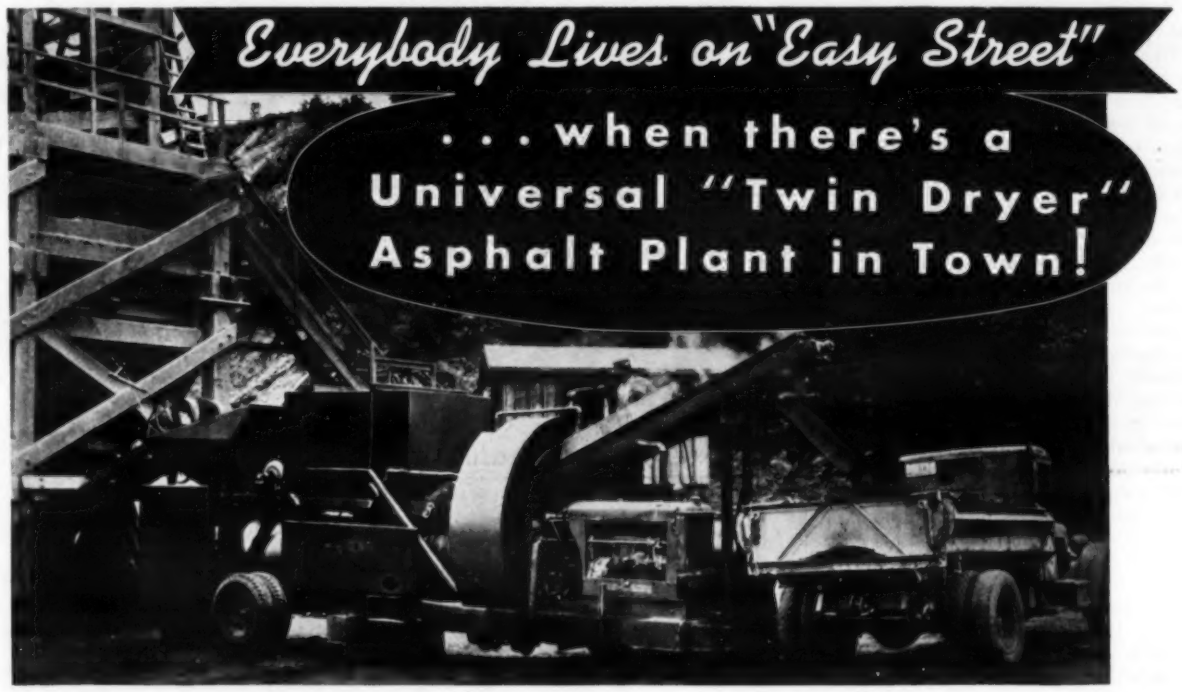
Effect of Pneumatic Tires

The popular conception of the action of pneumatic tires seems to have been obtained from observation of tires ordinarily used in cross-country hauling. Studies have generally been confined to the action of such tires on thin flexible road surfaces. One available record of

(*Continued on page 37*)

This full capacity, industrial ½" Drill is handier, more powerful and an all-around better drill than many costing a third more. Specially wound high torque forced-air-cooled motor. Improved "natural grip" end and breastplate handle applies thrust directly behind drill point—and all quality features: oilless bearings, streamlined die cast case, etc., etc.

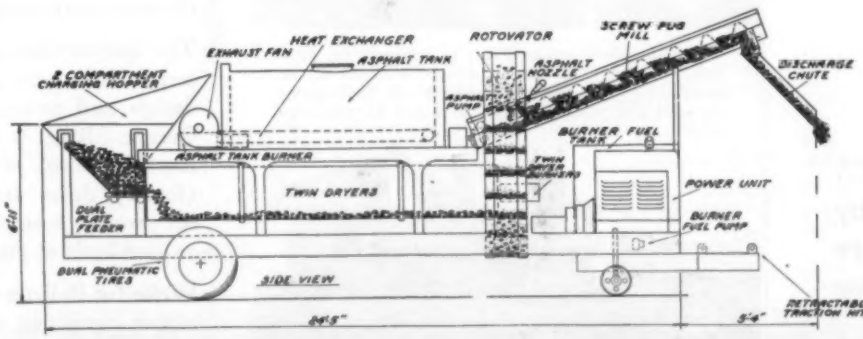
SPEEDWAY MFG. CO., 1949 S. 52nd Ave., Cicero, Ill.



Easy to ride over, easy on street department funds and easy to maintain, the "Twin Dryer" way. It's the most outstanding contribution to lower street maintenance costs in a decade. Produces material for maintenance, patching and small paving jobs. Starting with a minimum outlay for this compact, portable asphalt plant, it's economy right on through plus speed and a superior product. Towed by truck to gravel pit or supply yard — hopper is conveyor or bin fed. You get 40-tons per hour of blended and mixed asphalt that meets all requirements — asphalt that says, "Bring on your highway trucks!"

UNIVERSAL CRUSHER COMPANY

620 C Ave. West **Cedar Rapids, Iowa**



Universal engineering saves your dollars—space saving, unique heat economizing, thorough mixing, material through the plant in only 11½ minutes, low operating cost—put them to work improving your streets — send for Bulletin No. 57.

UNIVERSAL

CRUSHERS, PULVERIZERS, COMPLETE PLANTS, SPREADEROLLERS, PORTABLE ASPHALT PLANTS

LOWEST COST FOR HIGHEST DEPENDABILITY

Embury Luck-E-Lite HIGHWAY TORCHES

—the choice of experience. Give the most—and can "take the most." Tough. Rugged. Leakproof. Stay lit in roughest weather. Burn up to 48 hours at one filling. Easy to service. Easy to handle. Lighted torches can be conveniently carried by handy ring and chain.

Embury Mfg. Co., Warsaw, N.Y.

Highway to Alaska An Aid to Defense

Proposed Road from U. S. To Yukon Offers Benefits For Peace Time As Well; Route Under Discussion

✦ WHEN the territory of Alaska was purchased from Russia by the United States in 1867, at a cost of $7,200,000, it was popularly referred to as Seward's Folly. Since that time, total exports from the "Folly" have exceeded $1,250,000,000, and today Alaska assumes a new and greater importance to the United States as a strategic point in the defense of the Western Hemisphere.

The idea of an overland route to Alaska is not new; it has been discussed for well over 10 years and it has an important part in the Pan American Highway which would eventually link Alaska to Argentina, thus binding more closely in hemisphere solidarity the most remote points in North and South America.

The present Alaskan International Highway Commission, appointed by President Roosevelt in 1938 and consisting of Warren G. Magnuson, Representative to Congress from Washington, Chairman; Ernest Gruening, Director of the Division of Territories and Island Possessions of the Department of the Interior and at present Governor of Alaska; Thomas Riggs, Consulting Engineer, former Governor of Alaska and former Chief Engineer of the Alaska-Canadian Boundary Commission; James W. Carey, Consulting Engineer; and Donald MacDonald, Locating Engineer, Alaska Road Commission, has prepared a report on the proposed Highway which indicates its complete feasibility and reasonable cost, and is continuing its discussion with the Canadian Commission as to the exact route and methods of financing.

History of Project

The desirability of extending the highway-transportation system through British Columbia to Alaska and connecting it with the existing road system of that territory has been evident for many years. However, no definite practical proposal was made until 1928 when Donald MacDonald, Associate Engineer of the Alaska Road Commission, mapped a highway route back of the coast ranges from Hazelton, B. C., to Fairbanks, Alaska, and made a tentative estimate of the mileage and cost. The route he proposed is practically identical with the western route now being considered by the Alaska International Highway Commission. Mr. MacDonald organized an International Highway Association with branches at Fairbanks, Dawson, Vancouver and Seattle, and publicized the project in the United States. By 1930 the project had the official support of the President of the United States, Herbert Hoover, and Premier Tolmie of British Columbia.

On May 15, 1930, an Act passed by Congress authorizing the President to appoint three special commissioners to cooperate with representatives of Canada in a study of the project, and also authorized an appropriation of $10,000 to carry out this study. The three commissioners appointed were Herbert H. Rice, Detroit, Chairman; Ernest Walker Sawyer, Assistant to the Secretary of the Interior; and Major Malcolm Elliott, Corps of Engineers, U. S. Army, and President of the Alaska Road Commission.

In cooperation with the three Canadian Commissioners, the U. S. Commission made a study of available data, and on May 1, 1933, reported to the President, recommending that negotiations be conducted with the Government of Canada with a view to entering an agreement whereby each Government within its own borders would undertake to survey and locate the best and most practicable route, prepare specifications and reliable estimates of costs and resulting benefits from the project, and investigate plans for the financing of such a project. It was further recommended that suitable allotments or appropriations be made available to the Alaska Road Commission for carrying out the purposes of the agreement; that the respective governments, in formulating their road-construction programs, conform so far as practicable in their own interests to the general route proposed for this highway so that as many as possible of the local projects will be available for and form a part of the main project; and that consideration be given by the road-building agencies of Alaska and Yukon Territory to the construction of the Fairbanks-Dawson Road without waiting for the adoption of the entire project.

With the submission of this extensive 1933 report, the life of the special Commission expired. It appeared at that time that the project was on the verge of construction, but it became lost in the general uncertainties of the depression. The renascence of the project has been due largely to the efforts of the Hon. T. D. Pattullo, Premier of British Columbia, the Hon. Anthony J. Dimond of Alaska, and the Hon. Warren G. Magnuson, Chairman of the present Commission.

An Act of Congress, approved May 31,

(*Continued on page 40*)

For reducing
EQUIPMENT MAINTENANCE COSTS...

The SELF-LOCKING NUTS that can't be loosened by vibration or hard service

... specify them on new equipment and use them for replacement.

• Folder explaining the Elastic Stop principle is worth writing for.

ELASTIC STOP NUT CORPORATION
2333 VAUXHALL ROAD • UNION, NEW JERSEY

Elastic Stop SELF-LOCKING NUTS

The B-G Maintenance Plant is designed for flexibility of set-up to exactly meet the needs of the current job. The Dryer and Mixer are truck-towed separately for easier hauling, and may be used separately or together.

HERE IS THE ANSWER for Cities, States, Counties, and Contractors desiring the most economical means of producing the finest bituminous mix at from 15 to 30 tons per hour. It is no longer necessary to pay premium prices for small quantities of quality material or tolerate the inadequate quality of make-shift methods.

The Barber-Greene Maintenance Plant makes no compromise with quality of mix. It is of the same design and principle as the Heavy Duty Barber-Greene Mixer. It has the same PROVEN proportioning control, mixing control, and drying control. (Rotary drum dryer with atomized oil burners.) All proven through over 150 B-G Mixers operating on hundreds of jobs.

Write for Bulletin 840. There is no obligation. (For higher capacities, ask for Catalog 848 which shows the Normal and Heavy Duty B-G Mixers.)

41-4

BARBER B G STANDARDIZED MATERIAL HANDLING MACHINES GREENE
AURORA ILLINOIS

Highway Facts

The 1941 edition of *Highway Facts*, published by the American Road Builders' Association, contains even more valuable information than previous editions of this helpful booklet.

In addition to the usual lists of state highway department personnel and many tables showing highway mileages of various types, highway expenditures, and similar information, this year's edition also contains personnel lists, procurement offices, etc., for the government departments, including the Army, Navy, U.S.E.D., and other bureaus carrying on construction.

Copies of *Highway Facts* may be secured direct from the A.R.B.A., International Bldg., Washington, D. C. The price is $1.00.

Hydraulic Equipment

For years, maintenance men have struggled with pinch bars, blocking, and other devices using extra manpower and overtime to solve tough jobs in lifting, moving and maintenance. A substitute for many of these troublesome methods is offered in a new catalog and use manual which describes how "harnessed" hydraulic power can be employed for such jobs.

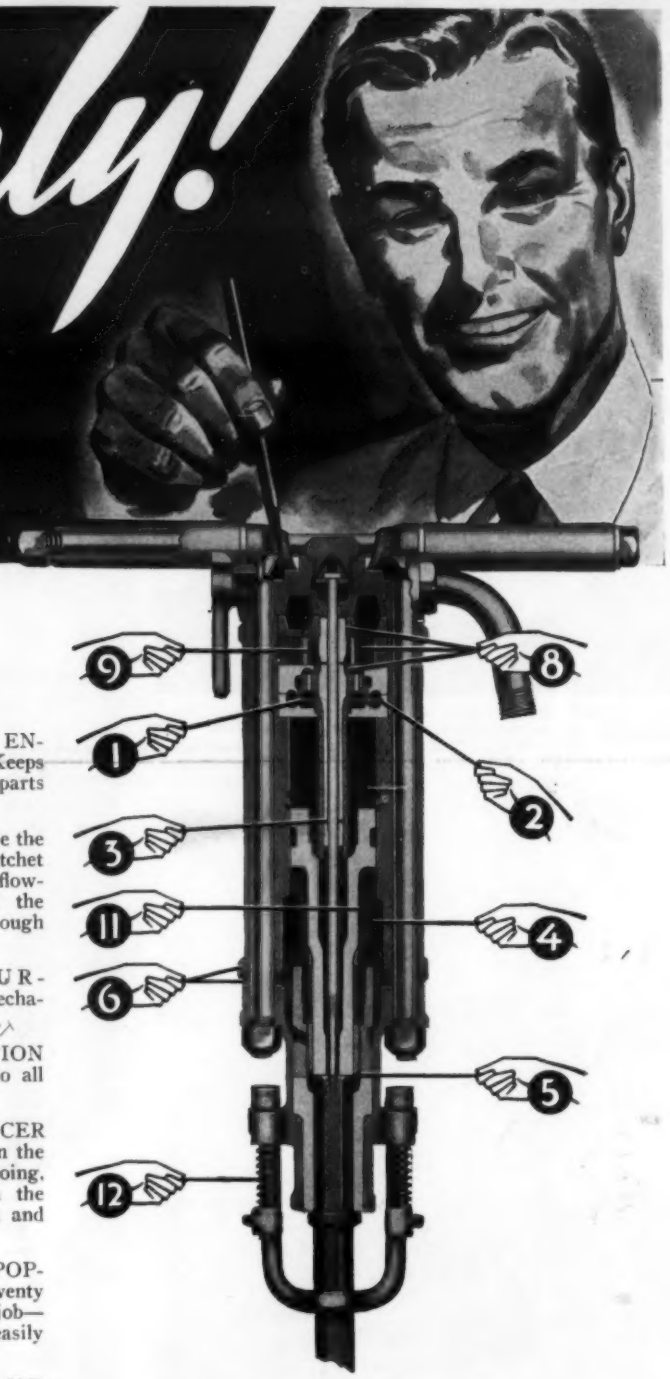
The catalog, No. 41-H, recently issued by the Blackhawk Manufacturing Co., Milwaukee, Wis., describes and illustrates applications of pipe benders, Porto-Power maintenance equipment, gage-equipped jacks, regular and inverted hand jacks and wheeled floor jacks. Copies of this catalog may be obtained by those interested direct from the manufacturer by mentioning this item.

Portable Air Compressors

The air compressors made by Gordon Smith & Co., Inc., 425 College St., Bowling Green, Ky., are available in single and double units, with a capacity of 60 and 120 cfm, powered with new or completely reconditioned Model A or B Ford motors. According to the manufacturer, the 60-cfm unit uses only one gallon of gasoline an hour; repairs and parts are available at Ford garages everywhere; there are no couplings, belt, clutch or gears to give trouble; and they are light and easy to handle.

Certainly!

THE CLEVELAND HIII IS A BETTER MACHINE



AND HERE ARE SOME OF THE REASONS WHY

1. END SEATING VALVE—The longer it runs, the better it gets.
2. NO INCREASE IN AIR CONSUMPTION as the drill grows old in service. The air is metered here between the outer rim of the valve and the wall of the valve chest.
3. POSITIVE LUBRICATION of the rifle bar and nut insures putting oil on the rifle bar at every stroke of the piston. Prolongs the life of these parts at least 50%.
4. AMPLE OIL RESERVOIR surrounding the front spacer insures lubrication for about four hours of operation.
5. FLOATING TYPE OF CLUTCH assures free action. Bronze chuck nut cuts down friction and wear on flutes of piston, and is easily and economically renewable.
6. LARGE CONTACT AREAS between major parts mean that the machine is always held in line, and that there is the minimum of wear on the faces.
7. THROTTLE DETENT ENTIRELY INCLOSED—Keeps it oiled, and shields the parts from dirt.
8. WELL LUBRICATED are the rifle bar bearings and ratchet mechanism, since all oil flowing to the back end of the machine is distributed through these parts.
9. TIME-PROVEN FOUR-PAWL ROTATION mechanism—rugged and reliable.
10. POSITIVE LUBRICATION SYSTEM distributes oil to all parts of the machine.
11. CHROME PLATED SPACER will wear much longer than the ordinary part, and, in so doing, preserves full cushion on the front end, avoiding piston and side-rod breakage.
12. STEEL RETAINER A POPULAR FAVORITE for twenty years. It takes care of its job—It stands the gaff—It's easily opened by hand.

WELL DESIGNED AND AMPLY LARGE EXHAUST PORT—freezing avoided under all conditions.

Model H111 is a 55-pound machine—Good for holes to eighteen feet and more.—The drill for shaft sinking and heavy jobs—Chuck suggested, 1" x 4¼". Can supply also chucks for 1" 1⅛", and 1¼" round lugged steel. You need strong drill steel for this powerful go-getter! Bulletin 122 on request.

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Birmingham, Ala. — Berkeley, Calif. — Boston, Mass. — Buffalo, N. Y. — Butte, Mont. — Chicago, Ill. — Cincinnati, Ohio — Dallas, Texas — Detroit, Mich. — El Paso, Texas — Ironwood, Mich. — Los Angeles, Calif. — Milwaukee, Wis. — New York, N. Y. — Philadelphia, Pa. — Pittsburgh, Pa. — Richmond, Va. — Salt Lake City, Utah — St. Louis, Mo. — Victor, Colo. — Wallace, Idaho — Winchester, Ky.

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WIRE US WHERE TO PLACE A CLEVELAND HIII ON DEMONSTRATION

The CLEVELAND ROCK DRILL CO.

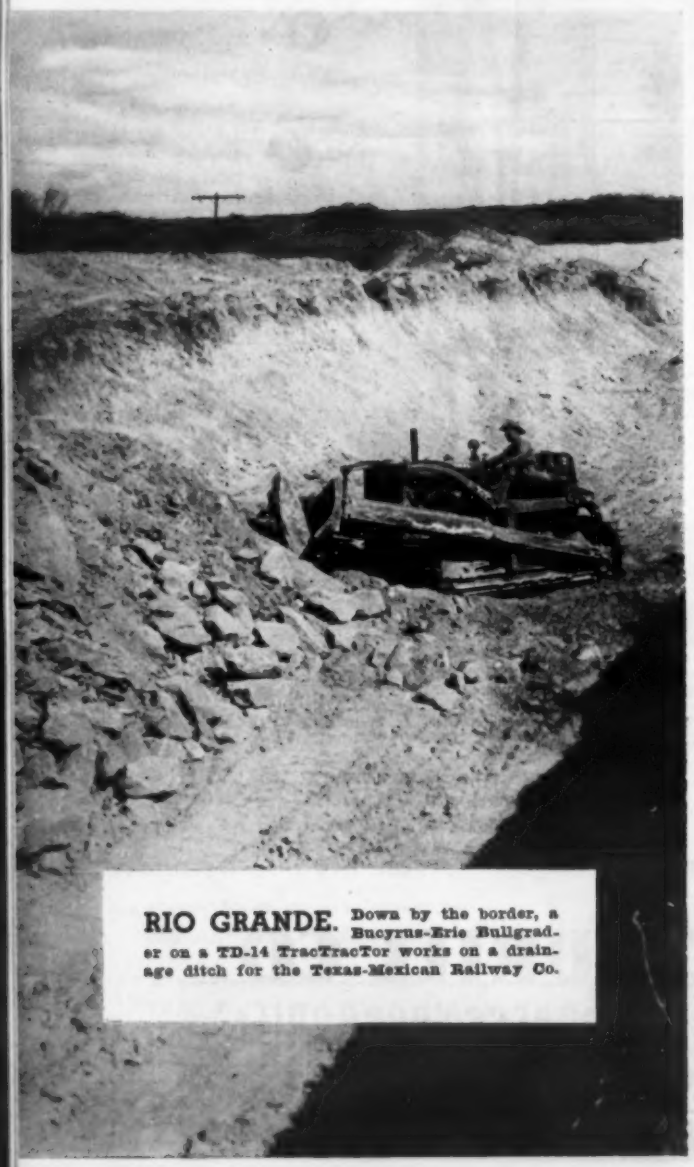
3734 EAST 78TH STREET, CLEVELAND, OHIO · · CABLE ADDRESS "ROCKDRILL"

LEADERS IN DRILLING EQUIPMENT

Bureau of Reclamation Photo

BY NIGHT, under batteries of powerful floodlights, work goes on full blast at Shasta Dam in California. This striking view was taken from the top of the east abutment.

AIRPORT construction goes on apace as part of the great National Defense Program. Here is one of the new Caterpillar rubber-tired diesel tractors and W10 wagons handling gummy material at the Oklahoma City airport.



RIO GRANDE. Down by the border, a Bucyrus-Erie Bullgrader on a TD-14 TracTracTor works on a drainage ditch for the Texas-Mexican Railway Co.

Bureau of Reclamation Photo

TRESTLE. An unusual view of the construction trestle at Friant Dam, California, showing the two types of cranes used for placing concrete in the dam below. This is a part of the Central Valley Project being constructed for the Bureau of Reclamation.

TUBE PILES. Short tack-welded extensions replace the usual wood cribbing to support a pile driver. The Union Metal Monotube steel pile casings were driven in one piece to a depth of 85 feet.

CAR BARN was the original purpose of this structure which, with the passing of the street car, became the Town of Amherst, Mass., Highway Garage. The sentinel at the right stands guard at the entrance to the grounds.

C. & E. M. Photos

CUTS on a new 12-mile section of Highway 180 in New Mexico were made by three 8-yard Koehring Wheel Scrapers, with TD-18 TracTracTors as pushers during loading. One of these outfits is shown working in a 36,000-yard cut. Ernest W. Everley was the contractor.

LAYING DUST on hundreds of miles of secondary farm roads is the task of this new Dodge Job-Rated diesel truck owned by Imperial County Road District No. 3 in southern California.

CANAL. With their long booms silhouetted against the sky, two Northwest draglines shown below excavate a section of the 37-mile long Madera Canal, part of the Bureau of Reclamation's Central Valley Project in California.

Bureau of Reclamation Photo

Road and Bridge Work In Washington County

(*Continued from page 2*)

levy a 1½-cent per gallon gasoline tax on all motor vehicles operating on highways, with certain exemptions. The first $50,000 of this first 1½-cent tax is placed in a special fund known as the Gasoline Tax Rotary Fund, and the balance of all receipts is paid to the Gasoline Tax Excise Fund. Thirty per cent of the gasoline tax excise fund is paid to cities, in proportion to the motor vehicle registration in the previous year, for use in street construction and maintenance. Then 25 per cent of the excise fund is paid in equal proportions to each county for the maintenance and repair of county roads. The balance, 45 per cent, is for the use of the State Highway Department.

A second 1½-cent tax on each gallon of gasoline is also collected and is disbursed in the following manner according to the 1937-38 Road Laws. Seven and one-half per cent of this highway construction fund is paid in equal portions to all counties for the construction, maintenance, widening and reconstruction of the county system.

Fees received under the Motor Vehicle Registration and License Law are distributed as follows: 25 per cent of the taxes under this law is for the use of cities and counties constituting the district of registration of the motor vehicles. The portion due to cities is paid to them by the county and the balance retained for use on county roads and highways, exclusively for "maintenance and repair". Then 5 per cent of the impounded fees becomes a fund for the several counties for highway and road purposes, divided equally. The next 47 per cent is distributed to the county in which the owner resides or has his business for which the vehicle registration was made and is used for the construction, reconstruction, improvement, maintenance and repair of roads and highways of that county.

The Central Repair Garage

The central repair garage is a structure 30 x 120 feet built on a concrete foundation with concrete floor and with a galvanized iron wall and roof. The main section of the garage is for storage of trucks with a parts storage section partitioned off, a portion of which is used for the storage of oil and grease. Within this partition a set of stairs leads to a mezzanine where there are more bins for the storage of parts, and racks for handles, old and new, for axes, mattocks and brush axes.

There are two repair sections, or stalls, in the rear of the main garage separated by the blacksmith shop and an open area which in summer is used as additional repair area. The repair shop nearest the main garage contains a monorail hoist, a mechanic's bench and a portable Oxweld acetylene outfit. The second repair shop is a real machine shop and contains a grinder for sharpening mower knives, a Black & Decker valve refacer and a valve seat grinder, a pair of power-driven grindstones, a South Bend lathe, a Canedy Otto drill press, a Weaver hydraulic gear press and a Weaver tire changer, and a garage compressor for tires and to furnish air for various purposes is mounted on the wall to save floor space. A Hobart electric welder, which is trailer-mounted and is used for the field repair of various pieces of heavy equipment, is used in the shop for repairs when not called upon for field service. Each of the repair shops and also the storage garage is equipped with a Buffalo hand fire extinguisher, easily accessible so that accidental fires may be checked promptly.

In 1937, Washington County enlarged the storage space on the south side of the garage by cutting away a hill and graveling the yard. This has been very beneficial inasmuch as employees' cars can be parked in this area without restricting the use of the nearby county highway for regular traffic and it has provided space for the anticipated addition to the storage garage. In this area also are stored bridge timbers by sizes. Inasmuch as practically all of the bridge work is well standardized, not only can the stock be appraised quickly but needed timbers can be secured promptly. All corrugated metal pipe or culverts are carefully stacked up, giving the yard a very neat appearance.

Road Work

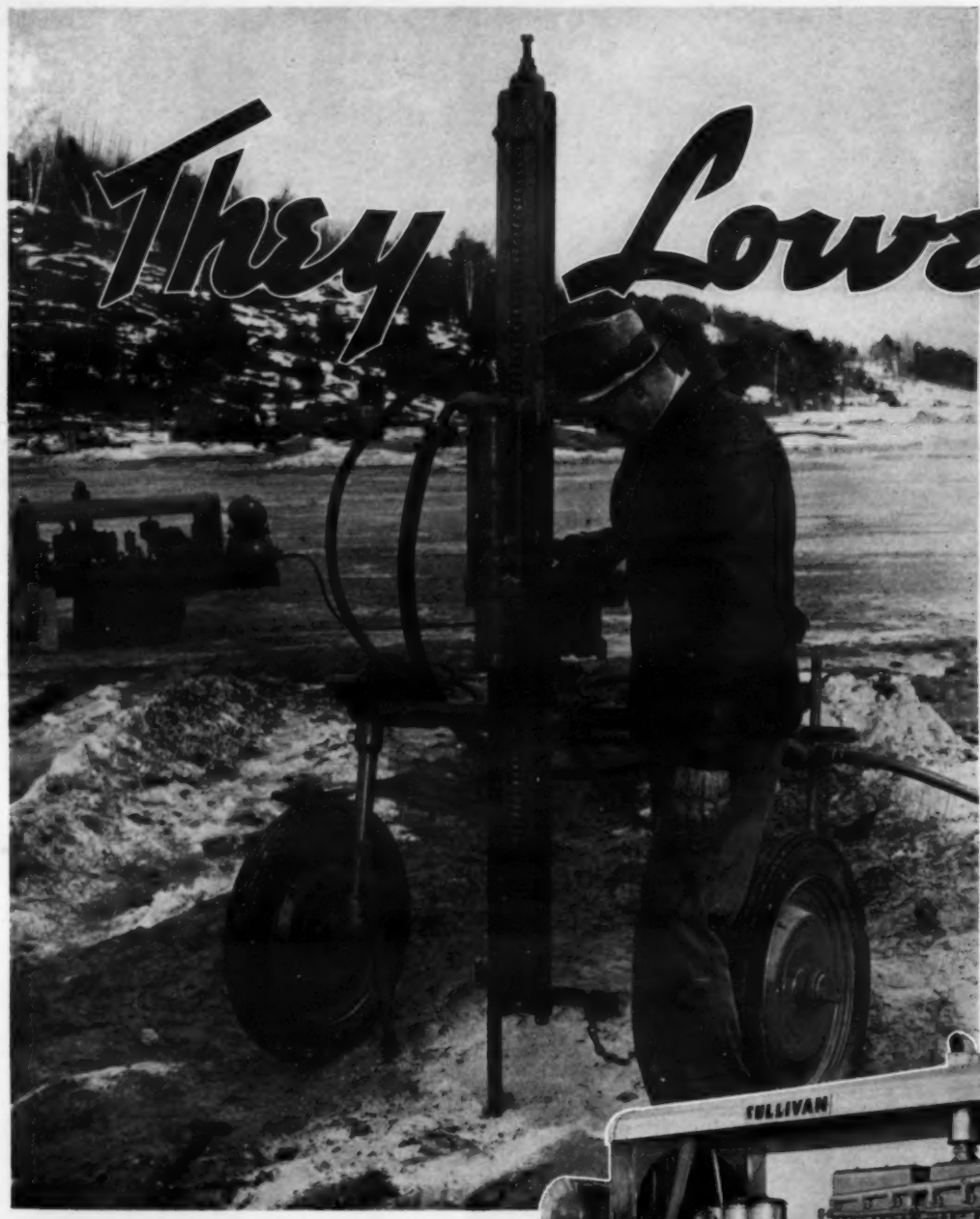
With its 250.379 miles of county road distributed through 630 square miles, the area of the county, improvement of roads with higher-type surfaces has been very slow. The County Engineer is working toward a 24-foot road bed on all county roads with 16 feet of gravel surface and 4-foot shoulders on each side with a standard 15-inch ditch. It is hoped to establish a program which will provide a light road-mix surface on the more important county roads by budgeting for a definite mileage each year.

At present the county uses from 60 to 90 tons of Solvay calcium chloride each year on the gravel roads where there are fairly good-sized groups of houses and in the villages, to reduce the dust nuisance. The calcium chloride is applied at the rate of 1 pound per square yard at the beginning of the dust season and then followed by two applications of ½-pound each as required later in the season.

The Equipment Roster

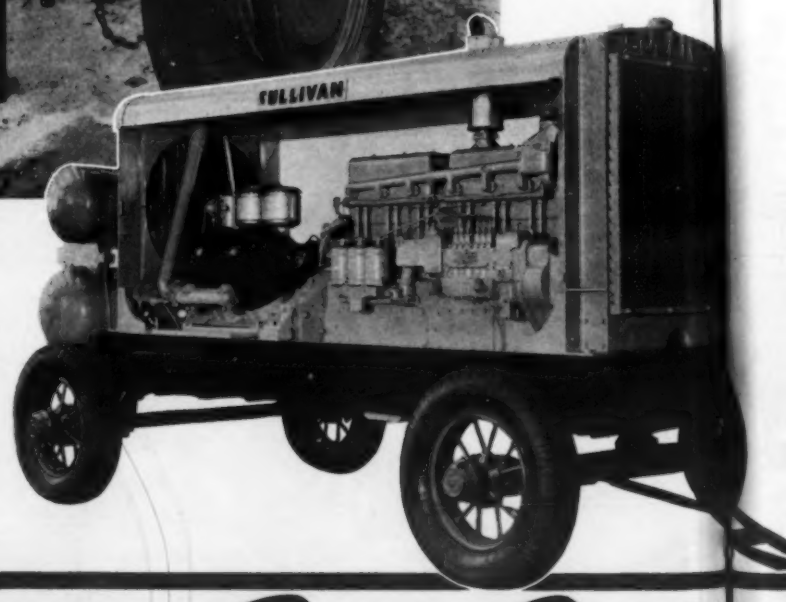
Washington County has a large proportion of modern effective road maintenance and construction equipment,

(*Concluded on page 42*)



Left: Sullivan LMW weight" Wagon Drill livan Portable Co being used on an air provement contract. also manufactures weight and heavy wagon drills. You lower drilling costs livan Wagon Drills. Bulletin 87-T.

Below: Sullivan 315' powered "Plus" Portab pressor similar to lowered operating cost per day. (See opposi for details.) "Plus" P are available in thre sizes, the 210', 160' Write for Bulletin A



OTHER PRODUCTS FOR THE CONSTRUCTION FIELD

Semi-portable and Stationary air compressors, core drills for foundation and damsite testing, soil samplers, rotary blast hole drill rigs, rock drill bits, furnaces and sharpeners, contractors' hoists, shaft hoists, tunnel loaders, portable lighting sets, portable safety lighting cable, car pullers and core drilling by Contract.

SULLIVAN *Rock Drills*

Birmingham, Ala.	619 North 10th St.	Duluth, Minn.	1 East Michigan St.	New York City, N. Y.	St.
Boston, Mass.	104 Brookline Ave.	El Paso, Tex.	117 North Kansas St.	Pittsburgh, Pa.	47 Terminal de
Butte, Mont.	24 W. Granite St.	Huntington, W. Va.	728 - 8th Ave.	Portland, Ore.	1631 N. W. St.
Chicago, Ill.	307 N. Michigan Ave.	Knoxville, Tenn.	201 Medical Arts Bldg.	Salt Lake City, Utah.	117 W. St.
Claremont, N. H.	1938 Main St.	Los Angeles, Calif.	2900 Santa Fe Ave.	San Francisco, Calif.	St.
Dallas, Tex.	1914 Commerce St.	Michigan City, Ind.	Woodland Avenue	Seattle, Wash.	3410 First th
Denver, Colo.	1815 California St.	Middlesboro, Ky.	105 So. 18th St.	St. Louis, Mo.	St.

The Fifth Column in Welding Operations

Invisible rays generated in welding, furnace, and foundry operations have been characterized as a fifth column menacing the eyes of workers. Speaking before members of the Masssachusetts Safety Council at their annual convention held in the Hotel Statler, Boston, W. H. Lehmberg, Safety Development Engineer of the American Optical Co., warned that injured or even blinded eyes may result unless the eyes are protected by special lenses which absorb the dangerous invisible rays.

Ordinary dark lenses, he asserted, cut down the visible light but harmful invisible radiations may not be barred by the glass. In view of the tremendous increase in light-generating operations brought about by the national defense program, he urged the wearing of lenses developed by science that absorb invisible rays.

Front-End Tractor Shovel

Front-end tractor shovels, made by the White Manufacturing Co., Elkhart, Ind., are equipped with a ⅜-yard struck-measure 42-inch-wide bucket and can be readily attached to four models of wheel-type industrial tractors, Case D1, International I-6 and I-30, and Minneapolis-Moline UT-1. The operator has one lever to control the clutch for raising the bucket and a brake to hold it at any point of lift; and another lever for releasing the bucket to discharge the load. The shovel automatically resets on its return to loading position. According to the manufacturer, this shovel can excavate, carry, hoist, load and backfill.

Complete data is contained in an illustrated circular, No. 36, recently issued by this company. Copies may be obtained by writing direct to the manufacturer and mentioning CONTRACTORS AND ENGINEERS MONTHLY.

Line of Concrete Mixers

The complete line of Rex concrete mixers from the 3½-S up to and including the 14-S are described and illustrated, with information on their individual features, in Bulletin No. 380 just issued by the Chain Belt Co., 1666 W. Bruce St., Milwaukee, Wis. One of the interesting features of the bulletin is the "tab" indexing which sectionalizes the book by machines and features. Each subject and each machine is in its proper place and can be easily found.

Copies of this bulletin may be obtained without obligation by writing direct to the manufacturer.

Costs $130.88 per month!

A large contracting company had been doing all their rock drilling with hand-held drills.

After purchasing a Sullivan LWM "Lightweight" Wagon Drill they found that they had cut operating costs $130.88 the first month and *had actually increased their average footage per shift two and a half times over that formerly possible with two of their hand-held drills!*

This is how they figured their costs:—

For the same footage drilled, their operating and labor costs totaled $19.52 per shift (when using a 210' compressor and two hand-held drills) as compared to $10.64 per shift using the Sullivan LWM Wagon Drill and a 160' compressor. This $8.88 per shift savings in operating costs over a period of 26 working days totaled $130.88. Their LWM Wagon Drill and 160' portable compressor cost about $300 *less* than the two 55-lb. drills and 210' portable compressor. As remarkable as this performance record is, it is not unusual for Sullivan equipment, as the following account will testify.

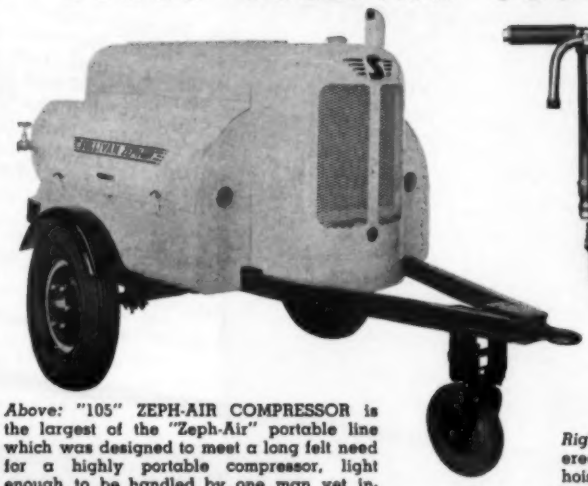
A Southwestern contractor writes concerning his new Sullivan diesel-powered 315' portable compressor:—"This machine was used on highway construction projects in San Saba and Menard Counties from November 1st to May 15th with very satisfactory results.

"On these particular jobs we operated four 57-lb. air hammers from the above machine at a fuel saving of approximately $12.00 per day, as compared to cost of operating two gasoline-powered portable compressors, the two machines having same capacity as above diesel unit. The Sullivan diesel fuel cost being around $3.00 per day for ten-hour day."

Such testimonials as this are conclusive proof that Sullivan equipment will lower construction costs.

Bulletins showing how you also can lower your costs with Sullivan Rock Drills, Compressors and Hoists will be sent on request.

OTHER SULLIVAN COST-LOWERING EQUIPMENT



Above: "105" ZEPH-AIR COMPRESSOR is the largest of the "Zeph-Air" portable line which was designed to meet a long felt need for a highly portable compressor, light enough to be handled by one man yet incorporating all the proved features of the heavier "Plus" Portable line. The other two sizes are the "60" and "85". For complete details write for Bulletin A-41.

Left: L-57 ROCK DRILL. The most popular drill in the 55-lb. class. Its "Dual-Valve" insures top performance and air economy. Other Sullivan drills: L-12, 65 lbs.; L-2, 45 lbs.; L-1, 30 lbs. Write for Bulletin 87-H.

Left: K-13 CONCRETE BREAKER. Weighing 81 lbs., it is the leader in the heavy duty class. Can easily be converted to sheet pile driver. Other Sullivan breckers: K-10, 79 lbs.; K-14, 58 lbs.; K-9, 45 lbs. Ask for Bulletin 87-N.

Left: SULLIVAN DETACHABLE BITS for maximum footage. Longer runs before changing gauge sizes and increased footage between regrinds. Write for Bulletin 87-G.

Right: G-112 HOIST is considered the world's most portable hoist and is preferred by leading construction companies because its light weight per horsepower developed allows speedy, low-cost transportation from one job to another. This cuts down the number of hoists necessary to complete each job and gives the lowest possible overall operating costs. *One large tank construction company now has one hundred and twelve G-112 hoists in actual use today.*

EQUIPMENT

Sullivan manufactures a complete line of ROCK DRILLS, CONCRETE BREAKERS, CLAY SPADERS, TRENCH DIGGERS, SHEET PILE DRIVERS and PLUG DRILLS. Write for Bulletin 87-H

90th Anniversary 1851—1941

SULLIVAN MACHINERY COMPANY

Executive Offices: MICHIGAN CITY, INDIANA

FACTORIES: MICHIGAN CITY, IND. • CLAREMONT, N. H. • DUNDAS, ONT. • GRANTHAM, ENG.

Associated House: Canadian Sullivan Machinery Company, Ltd., Dundas, Ontario

Road-Mix Resurfacing For Conn. Highways

(*Continued from page 6*)

located in Southwick and Westfield, Mass., and Suffield, Conn. The stone was delivered to the job by truck and spread 2¼ inches thick with a Jaeger 10-foot box attached to the rear of the trucks, with two men attending to the hooking and unhooking.

Asphalt and Mixing

The RC4 Shell asphalt was applied the full 10-foot width of the ½-inch stone at the rate of 0.9-gallon per square yard. This was immediately mixed with a Jaeger Model MP-1 Triple-Pugmill Road Builder pulled by a Linn tractor, the mixing being completed in one trip over the stone. The strike-off at the back of the mixer left the homogeneous mix smooth, ready for rolling. Only two men were required on the equipment, one to drive the Linn tractor and the other on the mixer. Three hand rakers were used on the edges and for spotting the few points where the wedge course was low and stone insufficient to fill it. When working the second side of the road, an extra man was used on the inside wing of the mixer to watch the strike-off at the joint and special attention was paid to the raking to obliterate the joint completely. This was quite successful from the standpoint of the riding quality of the road-mix although the joint could be seen as one drove over the road. The seal served to obliterate the visual joint completely.

On the extra-wide section in Granby and at intersections with other roads, the contractor decided to mix the material with the No. 12 power grader instead of with the traveling Road Builder. After spreading with the power grader, four rakers were used on the edges and for spotting. The Jaeger Road Builder regularly completed 1 to 1½ miles of road-mix operation 12 feet wide in 8 hours.

Rolling and Seal

During the hottest weather, rolling was delayed for about an hour after the road-mix operation was completed to allow the mix to cure. This was extended to a maximum of 2 to 3 hours in slightly cooler weather. The rolls of the 10 and 12-ton Buffalo-Springfield tandem rollers were wet to prevent pick-up of the surface material. Following the completion of rolling in the afternoon it was continued again the following morning, working at the same 2-mph speed.

For the seal, which followed as closely behind the rolling operation as possible, an application of 0.15 gallon per square yard of RC4 was applied to one-half the road and immediately followed up with 15 pounds of ½-inch stone chips per square yard, laid down by a Burch front-end spreader. This was followed immediately by the tandem roller. On the seal, work was done on one side for the distance of about a mile and then traffic turned on to it immediately and the other side sealed. The Lane organization was able to seal about 2 miles of full width of road in one working day.

Personnel

The contract for widening Conn. 10 and resurfacing with a road-mix and seal for a distance of 7.2 miles in the Towns of Simsbury and Granby was awarded to Lane Construction Corp. of Meriden, Conn., for whom William Stanton was Superintendent on this contract. For the Connecticut State Highway Department, William J. Cox, Commissioner, T. J. Mulcahy was Resident Engineer.

New Electric Etcher For Marking Tools

One of the nuisances on any construction job is the disappearance of small tools and parts. This is not only inconvenient but also becomes expensive over a period of time. Legible marking of such tools and parts to identify them definitely helps to eliminate this difficulty.

A new small electric etcher for permanently marking tools and parts has recently been announced by the Ideal Commutator Dresser Co., 1366 Park Ave., Sycamore, Ill. As its name implies, this Thin Line etcher writes with a fine line, burning the name, mark or identification number right into the metal so that it can not become blurred or worn off with ordinary usage, according to the manufacturer. To mark tools or parts made of iron, steel, or their alloys, they must be placed on the work plate. The etcher tool is then held and used as if writing with an ordinary pencil.

The complete unit includes the etcher and 4 x 6-inch work plate, 9 feet of primary lead and plug, a 2-ounce heat-resisting hand piece with 3-foot lead, and weighs 5¼ pounds. The standard unit operates on 50-60 cycle, 115 volts, although other frequencies and voltages are available. This new electric etcher model is an addition to the Ideal line of marking equipment which includes an electric marker and three other sizes of modern etchers.

Complete information on these etchers may be secured by interested contractors and state and county highway engineers direct from the manufacturer by mentioning this item.

RED DEVIL
LIGHT
and POWER PLANTS
800 to 50,000 WATTS

3,000 WATT
as illustrated on Pneumatic Tires
$395.00

Finish the job quicker and save money with electricity.

Send for catalog describing generators and our complete line of portable poles for floodlighting.

E. B. KELLEY CO., Inc.
43-47 Vernon Blvd.
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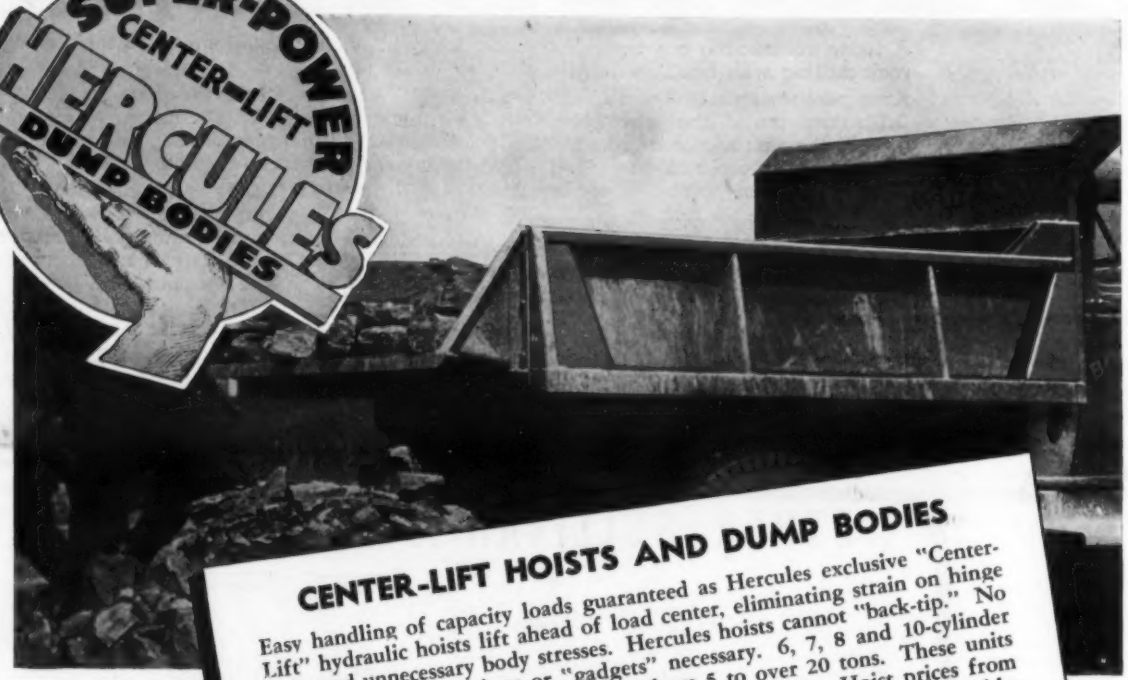
SUPER-POWER CENTER-LIFT HERCULES DUMP BODIES



CENTER-LIFT HOISTS AND DUMP BODIES

Easy handling of capacity loads guaranteed as Hercules exclusive "Center-Lift" hydraulic hoists lift ahead of load center, eliminating strain on hinge bolts and unnecessary body stresses. Hercules hoists cannot "back-tip." No regulating chains, springs or "gadgets" necessary. 6, 7, 8 and 10-cylinder hoists available with lifting capacities from 5 to over 20 tons. These units have the fastest dumping action of any hoists available. Hoist prices from $195.00 to $550.00 f.o.b. factory. All dump body types and styles available, SERVICE BUILT* for the load requirements and the type of work being done.

No matter where the job, Hercules hoists and dump bodies are within easy reach of a Hercules Sales or Service Representative. Over 80 authorized distributors assure prompt attention to parts and service.

*All Hercules Units are guaranteed free from defects in materials and workmanship for their entire active life.

HERCULES STEEL PRODUCTS CO.
GALION, OHIO

High discharge is one of the features of the new Haiss loader.

Hydraulic Lift for New Bucket Loaders

The problem of elevating the discharge chute of bucket loaders in order to deliver material over the high sides of a 20-cubic yard truck body led the George Haiss Mfg. Co., 139th St. & Rider Ave., New York City, to work out an interesting modification of its standard loader design. With the discharge chute clearance at 13.5 feet with a 45-degree chute angle setting, and a 7-foot reach from the bumper, an exceptionally high elevator is required.

A Haiss Model 135, the largest machine in the line, having 36-inch wide buckets and a rated capacity of 5 to 8 cubic yards a minute, was equipped with a hydraulic lift mechanism in place of the usual hand-wheel-operated device for raising and lowering the digging end of the elevator, either for setting the digging level or lifting the elevator to a horizontal position for traveling. Two hydraulic cylinders or jacks are used, one mounted on either side of the elevator. The latter has been structurally stiffened to make certain that any twisting strains imposed on the shaft of the revolving paddle feeding device will not be transmitted to the hydraulic cylinders. The latter are actuated by oil pressure, the power being supplied by an oil pump attached to the 65-hp Waukesha engine which powers the loader. Control is by means of a simple two-way valve located at the operator's platform. A spring return to neutral affords a satisfactory factor of safety.

The loader illustrated is fitted with broad-blade serrated-edge feeding propellers which are standard equipment for digging, pulverizing and loading top soil, one of the types of work for which this high-speed machine is designed. In the field and on top-soil work, it is reported that this loader has put up a 20-yard load in 3 minutes 41 seconds. The machine is also used for loading construction materials, gravel, sand, crushed rock and cinders.

Catalog on Equipment for Eye and Face Protection

The Sellstrom Mfg. Co., 615-49 N. Aberdeen St., Chicago, Ill., states that the main features in its equipment for eyes and head protection are marked reductions in weight wherever practical and possible; many special devices for easy-fitting adjustment and self-ventilating construction; and improvements that insure greater comfort to wearers. These features are described in detail in a catalog recently issued by this company covering its complete line of eye and face Safeguards. New Sellstrom products described include the Nos. 3001, 2 and 3 industrial spectacles, the No. 421 industrial goggle and No. 66 inspectors' handshield.

Those interested may obtain copies of this catalog direct from the manufacturer by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

Arc Welding Keeps Equipment on the Job

Typical of the part being played by arc welding in maintaining equipment on large defense construction projects is the work of Donald G. Grant, welder, of Watertown, N. Y. He reports that unusual demands for repairs are necessitated by working in frozen ground in the all-year-round top-speed program of defense construction. Approximately 150 pieces of equipment, including shovels, earth movers, tractors, etc., have been in use on a large project near Watertown, keeping eight welding operators constantly busy.

The accompanying illustration shows the repair of the bucket teeth from a large power shovel. These teeth were built up at the face three times during the past winter due to the frozen ground in which the shovel was operating. It was also necessary to reinforce the back of some of the teeth by welding strips of spring steel to each side.

In building up the teeth, use was made of manganese wedge bars welded in place with Lincoln Stainweld A5 and then hard-faced with an Abrasoweld electrode. Stainweld A5 is a shielded arc electrode made expressly for welding this type of metal in overlaying manganese parts, while Abrasoweld for hard-facing the teeth after the application of the wedge bar is a self-hardening deposit which resists abrasion, battering and impact.

Bucket teeth, worn down from digging in frozen ground, being built up by arc welding.

PILE HAMMERS and EXTRACTORS

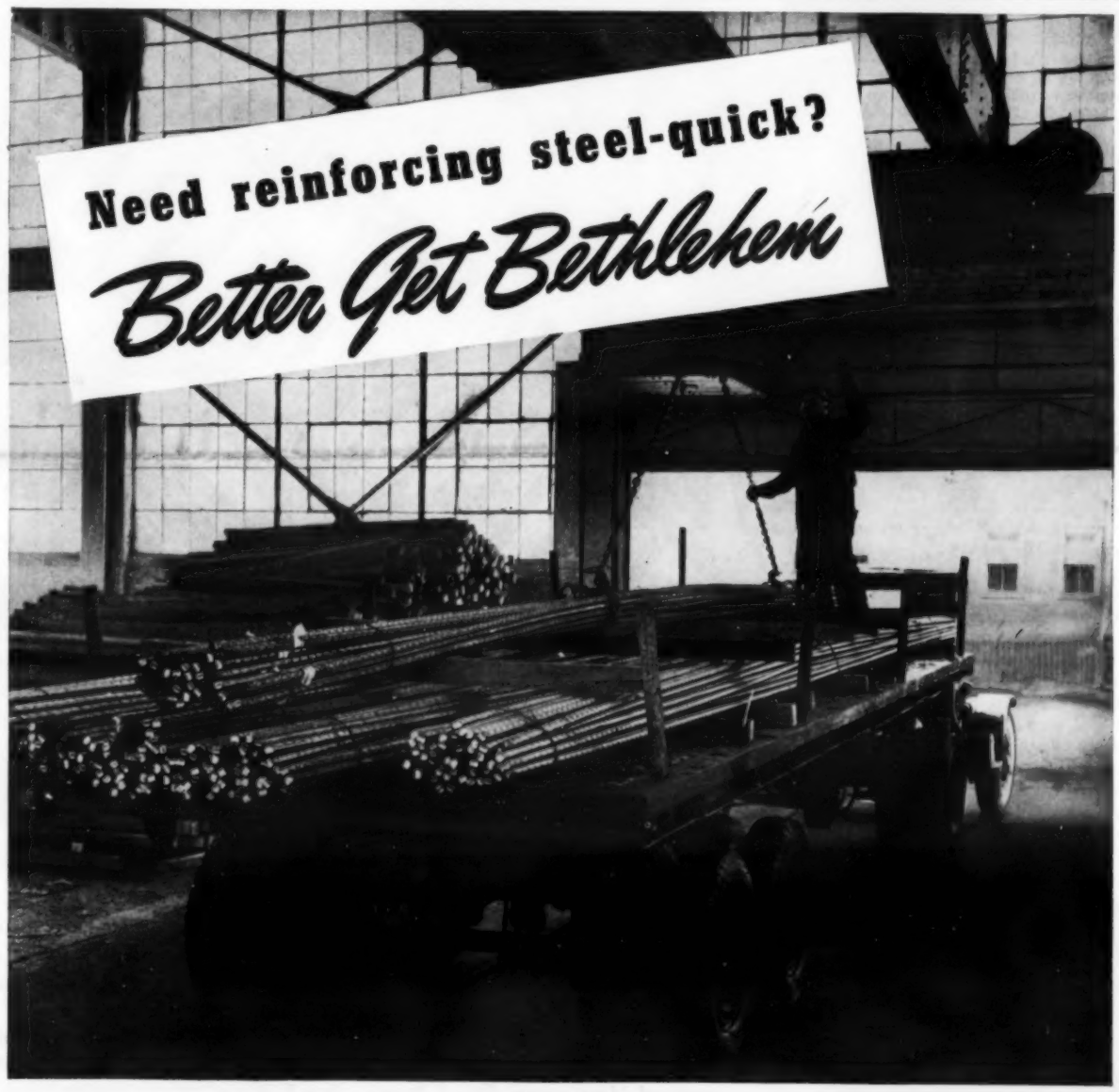
HOISTS—DERRICKS WHIRLERS

Special Equipment
Movable Bridge Machinery

Write for descriptive catalogs.

McKIERNAN-TERRY CORP.
19 Park Row, New York

Distributors in Principal Cities



Bethlehem distributors can be depended on to get reinforcing steel to you with minimum delay. That's because Bethlehem has strategically located warehouses in major construction areas, where there are large stocks of all standard sizes of reinforcing steel, welded wire fabric, bar supports and spacers; and where Bethlehem can cut and bend reinforcing steel to your specification.

Contractors have found it pays to make Bethlehem their central source of supply for reinforcing steel and allied materials, regardless of the size of their order. You'll find it equally profitable, equally satisfactory.

Save time! Make a note of the Bethlehem warehouse nearest you, and order through your distributor or local Bethlehem office.

Atlanta	*Danville, Pa.*	*Philadelphia*
Baltimore	*Detroit*	*Pittsburgh*
Boston	*Johnstown*	*St. Paul*
Buffalo	*Los Angeles*	*San Francisco*
Chicago	*New York*	*Seattle*

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY

Eroded roadsides like that above on U.S. 81 in Nebraska were planted with native hayfield sod, as shown in lower photo on Nebraska's first roadside-development contract.

Sodding to Control Erosion in Nebraska

Types of Sod Carefully Selected For Varied Purposes: State's First Erosion-Control Project Done by Contract

✦ CONTRACTS for a 14-mile roadside-development project, consisting of soil-erosion control work, seeding, and planting of trees and shrubs, on U. S. 81 south of Columbus, Nebraska, were awarded to the Platte Valley Construction Co., Grand Island, Nebraska, and A. L. Cook, Ottawa, Kansas, by the Nebraska Department of Roads and Irrigation. The job was about evenly divided between valley and table land, separated by a mile-long hill subjected to heavy drainage and resultant erosion. Because of soil conditions, this slope was a source of continuous trouble to the Maintenance Division and had necessitated a repair cost of approximately $2,000 over a period of 18 months. Diversion dams had been repeatedly washed away, culvert walls were threatened and roadside ditches were eroded to a point of serious menace to traffic. This problem required an immediate and permanent solution. Under the design and supervision of the Department of Roads and Irrigation, the Platte Valley Construction Co. contracted to perform the soil-erosion control work contemplated to remedy the situation. Work was started on March 20, 1940, and completed on April 15, 1940.

Five species of native grass sod were stripped from fields by means of a sod plow. The sod was cut 4 inches thick and each species was chosen for its particular characteristics and adaptability for the purpose it was to serve. The road shoulders were sodded with blue grama and buffalo grasses because of their short-growth characteristics, requiring no mowing. Native hay-field sod comprising big blue stem, switch grass, sand dropseed, and blue grass was used for lining the roadside ditches because of their ability to withstand silting. The same sod was used about the culvert walls. Western wheat grass and slough grass were employed upon diversion dams and steep shoulder slopes, because of the dense root system of the one and the extreme height of the other in supplying a channel "floor" when laid down by flood waters.

Personnel

All work was carefully and neatly done, with full recognition by the contractor of the contract requirements and the frailty of the medium used. Because of his extreme willingness to cooperate with the Department of Roads and Irrigation engineers and to make the job a model example of craftsmanship, R. V. Kirk, Superintendent for the Platte Valley Construction Co., was nominated for one of CONTRACTORS AND ENGINEERS MONTHLY'S 1940 Roadside Development Awards.

This $3,790 project represents the first time sod-erosion control has been used in Nebraska highway work and also the first time a highway contractor has participated in roadside-development work of this nature in that state. The result has been a complete success, has ended costly and unnecessary maintenance, and attracted public attention.

William L. Younkin is Landscape Engineer of the Nebraska Department of Roads and Irrigation, and Earl Oehring was Resident Engineer on this job.

California spent $102,000 in 1939 to control weeds and other vegetation along its highways, according to Highway Highlights.

The Original BucketruX

Trade DEMPSTER DUMPSTER Mark

Reg. No. 353486

Mfgd. by

DEMPSTER BROTHERS, Inc.

Knoxville, Tenn.

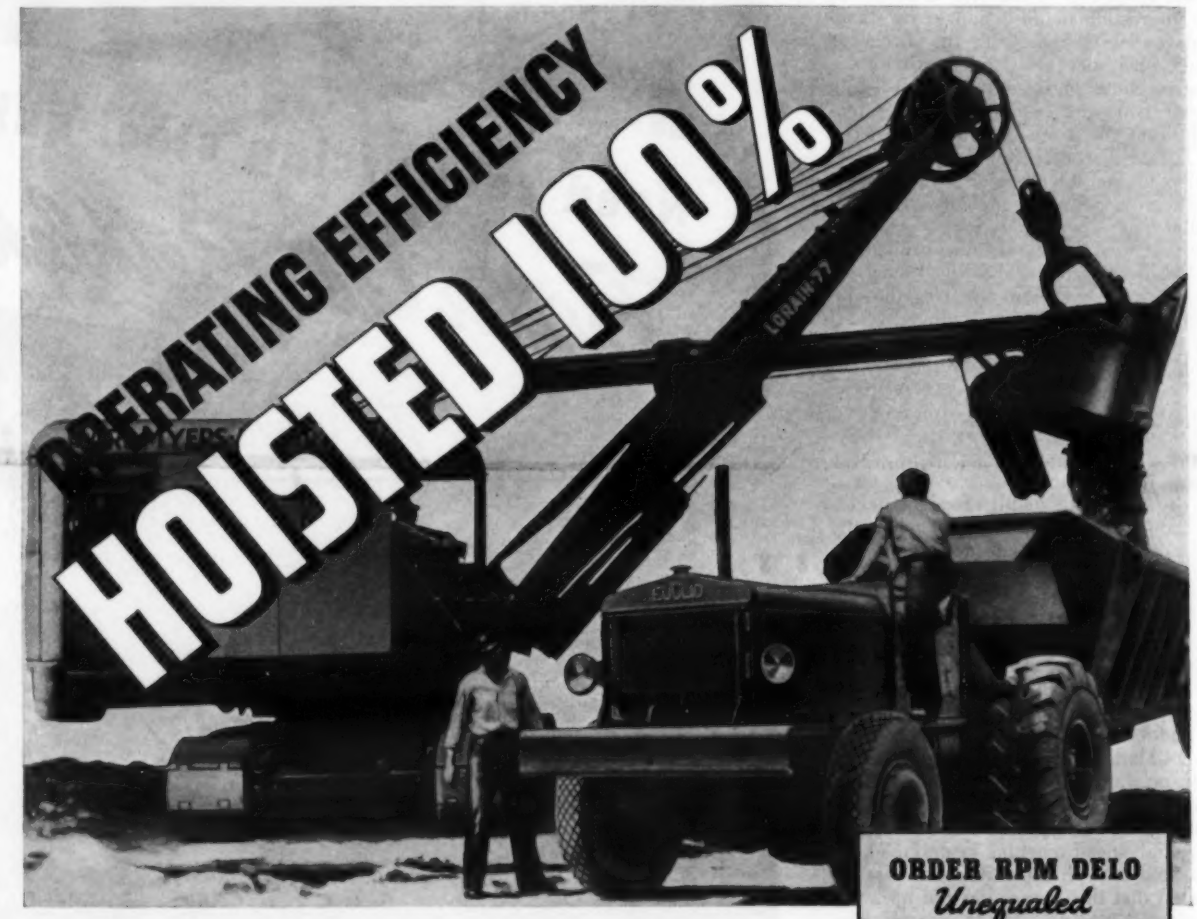
3½ E. D. LANSING TRAILER MIXER

This new Lansing Trailer Mixer is faster, more compact and easier handled. Its overall length is only 57" and entire width 68", with a height of 65".

It has a convenient shoveling height of only 42½", with a 31-inch drum. Sturdy 1⅞" axles, and 26" wheels with pneumatic tires. Weighs only 950 lbs. Write or wire NOW for complete information.

LANSING COMPANY

LANSING, MICHIGAN



Who says RPM DELO can do it? Lorain and Bucyrus-Erie shovels—Caterpillar Tractors—Le Tourneau Scrapers—bulldozers—Euclid Trac-Trucks—compressors, working for the Carl Myers Construction Company of Morristown, Ohio! States Mr. Myers—

"RPM DELO has been used by me for over 10,000 working hours and I find that the freedom enjoyed from ring sticking has reduced overhauls *and increased operating efficiency 100%.*

"At the moment we are working on the Belmont County, Ohio, job which involves moving three-quarters of a million yards of dirt, rock and shale. We are working against a set completion date and it is necessary that we avoid any costly breakdowns. We are now ahead of schedule and we believe that through the use of RPM DELO we have protected ourselves against any unnecessary shut-downs . . ."

Save *yourself* shut-downs, overhauls, repairs. Besides stopping ring sticking, RPM DELO ends sludge trouble and has *unequaled* ability to *stay put* and lubricate "hot-spots." Other oils actually run away from them!

ORDER RPM DELO *Unequaled* FOR YOUR DIESELS

Approved by the makers of over 95% of the installed Diesel horsepower in America, RPM DELO is marketed under the following names:

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Ask your Diesel engine manufacturer or distributor for the RPM DELO supplier in your locality.

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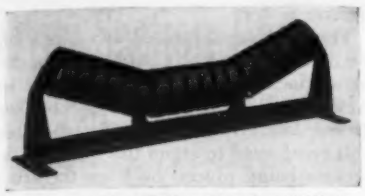
DIESEL ENGINE LUBRICATING OIL

UNEQUALED FOR EVERY DIESEL

STANDARD OIL COMPANY OF CALIFORNIA



The new Link-Belt rubber tread idler.

Rubber-Tread Impact Belt-Conveyor Idler

Following the announcement of a new Link-Belt rubber-tread return run idler for belt conveyors, the Link-Belt Co., Indianapolis, Ind., has now brought out a new troughing-type rubber-tread impact idler designed to absorb the shock of receiving heavy lumpy rough materials at the loading point.

The cushioning effect of rubber-to-rubber contact between belt and idler, it is pointed out, prevents cutting and bruising the belt and protects the bearings and framework from shock, thus prolonging the life of both belt and idler. The molded rubber-tread rolls, 6 inches in diameter, are firmly secured to a Friction Fighter roller-bearing-equipped tube by set screws through malleable iron spacers which clamp over reinforced rubber hubs. These rolls are said to cushion even the heaviest blows.

These new idlers are available for belt widths of 14 to 60 inches. Larger-diameter rolls can also be supplied, as well as rubber-tread impact rolls for flat-belt conveyor idlers. Further data on these new units are contained in Folder No. 1793, copies of which may be secured direct from the manufacturer by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

New Rock Drill

Because of the many new features incorporated in the 55-pound Jackhamer recently announced by the Ingersoll-Rand Co., 11 Broadway, New York City, all of which are designed to make it easier on the operator, this new rock drill is known as the Easy-Holding JB-5. One of the reasons for its reduced vibration is a refined valve action which, it is stated, also results in more economical use of compressed air. Another new feature is an easy-opening, long-life steel holder which is designed to reduce the time and effort necessary in changing drill steels. This holder is either hand or foot operated, eliminating bending over.

Other features include a drop-forged blower valve handle, large exhaust opening, two-piece chuck, thicker cylinder walls, and large bearing surfaces within the drill. The lubrication is positive and thorough.

A new illustrated booklet, Form 2734, giving many interesting details on this new Jackhamer, may be secured direct from the manufacturer.

Form Accessories

The stud Tyholders for use on built-up panel forms for dams, concrete walls, bridge abutments and similar construction which are made by Superior Concrete Accessories, Inc., 4249 Diversey Ave., Chicago, Ill., consist of a simple one-piece malleable casting designed as a bracket, with a beveled shelf. This shelf contains a horizontal slotted opening, enlarged at one end to pass the head washer on the Snap-Ty.

To draw the form tightly against the spreader washer, the stud Tyholder is simply moved along the stud in a direction away from the hole in the slot, the beveled shelf providing the necessary wedging action. This can be done with the hands, without the use of a hammer. It may be secured against slipping on a vertical stud by driving a small nail beside it. For removal, the Tyholder is moved along the stud until the head of the Snap-Ty passes back through the hole in the slot. The forms are then stripped, and the Snap-Ty broken back of the wall face by a Snap-Ty wrench.

Further details on these Tyholders and Snap-Tys, with diagrams of their use and information on various methods of form erection, are contained in literature which may be secured direct from the manufacturer by mentioning this magazine.

STERLING No. 3 CONCRETE CARTS

STERLING No. 3 CART

This cart can be furnished with pneumatic tires

30″ or 36″ dia. wheels, 6 cu. ft. capacity, 14 gauge tray, underslung heat-treated axle, plain or roller bearings.

A COMPLETE LINE OF STERLING WHEELBARROWS AND CONCRETE CARTS

STERLING WHEELBARROW CO., MILWAUKEE, WIS.

Better EUCLIDS ...and more of them!

A message to our customers and friends:

Improving quality and increasing production at the same time is no easy task today—but with your help Euclid is doing it.

Even before defense projects and orders dominated the scene, your steady demand for Euclids kept our factory busy. Old customers bought more Euclids . . . new customers tried Bottom-Dump and Rear-Dump EUCLIDS for the first time—and then came back for more. Equipment sales for 1940 exceeded those for 1939 by more than 50%!

Thus you made it necessary and possible to make important additions and improvements to our manufacturing plant and equipment. When the defense rush came, Euclid was better prepared . . . trained workmen were ready . . . more machine tools were here or on the way . . . production was stepped up steadily. During the first four months of this year alone, you ordered and received two-thirds as many Euclids as during the whole preceding year.

While trying to keep pace with your growing requirements, Euclid has also remembered the vital importance of quality to economical performance. The superior caliber of Euclid design, material and construction is being consistently maintained and improved. Euclid will continue to supply you with *better* EUCLIDS . . . and more of them!

THE EUCLID ROAD MACHINERY CO. • Cleveland, Ohio

EUCLID SELF-POWERED EARTH • ROCK • COAL • ORE HAULING EQUIPMENT

And — CRAWLER WAGONS • ROTARY SCRAPERS • TAMPING ROLLERS

Carey Elastite EXPANSION JOINT

Standard in Concrete Construction for 25 Years

ECONOMICAL and EFFICIENT

Asphalt Joint • Rubber Joint
Non-Extruding Expansion Joint
Plate-Dowel Expansion Joint
Sub-grade Felt

THE PHILIP CAREY COMPANY

Dependable Products Since 1873

LOCKLAND, CINCINNATI, OHIO

Concrete Handling At Loyalhanna Dam

(*Continued from page 1*)

terial is then rehandled from the storage bins to the hopper, when needed, by a guy-line steel derrick with a 100-foot boom and a Williams 1½-yard clamshell.

Bulk cement is hauled from the same railroad siding by a subcontractor, using dump trucks with a canvas cover. The cement is delivered to a hopper and is then raised by a bucket elevator to a 3,612-barrel silo. From a screw located at the bottom of the silo the cement is delivered to the same bucket elevator and thence to the batcher bin of 26-barrels capacity. A change-over on the bucket elevator shifts the cement either into the silo or the batcher bin.

The Batching Plant

The following table shows the dry weights of the various aggregates as well as the cement and water in the three mixes used in the construction of Loyalhanna Dam:

DRY WEIGHTS IN POUNDS

Material	Mix A	Mix B	Mix C
3 to 6-inch stone	None	2,040	2,105
1 to 3-inch stone	2,680	1,770	1,835
¼ to 1-inch stone	2,120	1,440	1,485
Sand	1,850	1,700	1,760
Cement	1,034	846	658
Water	476	412	379
Water, gals./sack	5.5	5.5	6.5
Sacks cement/cu. yd. of concrete	5.5	4.5	3.5

Four operations are used in batching. An air switch is thrown which sets the Kron scale successively for the weight of the sand, then for the 6-inch stone, then for the 1-inch stone, and then for the 3-inch stone. Each time the air switch is thrown a hand lever is used to control the flow of the material until the dial on the Kron scale goes back to zero. The next time the air switch is thrown it clears the scale and sets it again for the next size of material. It is possible to batch the materials only in the order given above. A graphic record of the batching of each aggregate and the cement is automatically recorded as a permanent check. Water is automatically batched and released separately as is the cement.

Mixing and Hauling

One lever on the control floor is used for dumping the weighed batch to the left and another to the right mixer.

Some of the 20-foot panels of cantilever forms at Loyalhanna Dam.

Once having been charged, the mixer can not be discharged for 2 minutes, the mixing time for the batch. This is controlled by a timer and an air switch. A red light shows during this 2-minute period and is connected to the timer by a Mercoid switch. This light was installed on the plant as an aid to the operator. The mixers are 2-yard Smith tilters driven by 30-hp Allis-Chalmers electric motors.

The concrete is hauled away in a single 3-yard Blaw-Knox roller-gate bucket on a Mack 15-ton truck with rails set in at the sides to prevent the buckets sliding laterally and with the truck bed well reinforced to stand the shock of the buckets being placed back on the truck by the cranes.

A novel but not too safe method of shifting the empty bucket on the truck is used at the batching plant. A long railroad tie is set on a post at the batching plant and braced with a heavy 4-inch angle. The truck carries out a loaded bucket next to the cab and the empty bucket is set in back of it and then the full bucket removed. The truck returning to the batching plant backs up under the timber which pushes the empty bucket forward against the cab. A bucket hooker rides the truck and dumps the concrete from the mixer by means of an air piston. He steps up on the long railroad tie to do this just as the truck is backing under the delivery chute to

(*Concluded on next page*)

For consistent, sustained performance—Gardner-Denver Two-Stage, Water-Cooled Portable Air Compressor. Actual air delivery from 85 to 365 cu. ft. per minute.
For drilling speed and power in general mining, quarrying and contracting —Gardner-Denver S-55 Sinking Drill.
For smooth vibrationless power—Gardner-Denver AF-99 Motor-Feed Drifting Drill.
Here's Your REFERENCE FILE ON LOW-COST PERFORMANCE
For complete specifications write Gardner-Denver Company, Quincy, Illinois.
GARDNER-DENVER
Since 1859
For faster drilling, easier handling over rough ground: Gardner-Denver UM-99 Universal Mounting Wagon Drill.
For continuous heavy duty service—Gardner-Denver "HA" Two-Stage Horizontal Air Compressor. Capacities from 468 to 1854 cu. ft. per minute.
For high pressure grouting—Gardner-Denver 10x3½x10 Grout Pump equipped with "Slush-Proof" liners and valves.
For lower drill maintenance costs—Gardner-Denver DS-6 Drill Steel Sharpener.

WET *Jobs?*

Dry Subgrades Guaranteed with

GRIFFIN WELLPOINT SYSTEMS

Whether you Buy or Rent!

YOU'LL REDUCE ALL YOUR COSTS ON WET EXCAVATIONS WITH GRIFFIN EQUIPMENT

Lowest costs for . . .
INSTALLATION, OPERATION & MAINTENANCE

Highest capacity in . . .
WELLPOINTS, VACUUM & WATER PUMPS

BOTH Equipment and Dry Jobs are guaranteed . . . Let us prove that GRIFFIN EQUIPMENT IS BETTER!

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725 EAST 140th STREET • NEW YORK, N. Y.
Phones: MElrose 5-7704-5-6

Gravity-Section Dam For Flood Control

(*Continued from preceding page*)

push the empty bucket ahead.

Cantilever Forms

This contractor uses 20-foot panel cantilever forms for the concrete, with 2 x 6-inch tongue-and-groove sheathing for facing and eleven 4 x 10's as vertical studs. On each 20-foot panel, a 12-inch channel wale is used at the top, a 10-inch channel wale at the bottom and double 5-inch channels, back to back, in the middle, with a 1½-inch spacer and five she-bolts. Each panel has two sets of 2 x 10-inch diagonal braces for strength.

The slope of the panel is adjusted with wooden wedges under the lower cantilevers which extend one 5-foot lift below the section being poured. A single scaffold at the bottom of each 20-foot panel makes it easy and safe for the men to drive the wedges to adjust the form satisfactorily.

Four horizontal arms at the top of the forms in each 20-foot panel have 1-inch holes through which ¾-inch rods extend into the concrete to hold the forms when the she-bolts are released from the ties in the concrete. This prevents the form from dropping and thus makes it safe for men to work on it when it is being released, without the support of cables.

Placing and Curing Concrete

Three American guy-line steel derricks are used for handling the panel forms, concrete and steel. After the top surface of each lift of concrete is set up sufficiently, the laitance is cut and washed off with a jet of air at 100-pounds pressure and water at 60-pounds pressure. Just before a new lift is poured, the top surface is again washed off and then covered with ½ inch of grout. The concrete is delivered to the form in buckets by the derricks. A crew of ten men constitutes a concreting unit, including two men on each of the two Chicago-Pneumatic electric vibrators operating at a frequency of 7,200.

For curing, spray nozzles set at convenient intervals are used. Well water is employed for this purpose and the high iron content of the water has stained the face of the dam a copper color which is quite striking as one approaches the massive structure.

Personnel

Great Lakes Dredge & Dock Co. of Chicago, Ill., is contractor for the construction of Loyalhanna Dam, with Sam J. Wright as Superintendent. The work is done under the direction of the Pittsburgh Office, U. S. Engineer Department, Lt. Col. L. D. Worsham, District Engineer, with Ralph Patt as Resident Engineer.

New Buda Export Man

Announcement has been made recently by The Buda Co., Harvey, Ill., of the appointment of E. W. Heinrich as a divisional export manager, in charge of Buda's export business between Mexico and the equator. George H. Koons, division export manager for Buda for many years, will have as his territory everything in South America below the equator and will establish headquarters at Rio de Janeiro, and later in Buenos Aires.

New Catalogs Describing Earth-Moving Equipment

The LaPlant-Choate Mfg. Co., Inc., Cedar Rapids, Iowa, has recently issued several new folders, each 16 pages in two colors. Form No. A-110-636 describes all of the equipment made by this company, with sections devoted to land-clearing, earth-moving, and snow-removal equipment. Each product is illustrated and a short item on its uses is included. Form A-111-637 describes the LaPlant-Choate hydraulic trailbuilder and contains informative data on the hydraulic controls, down pressure and positive lock, and the interchangeability of tools. Information is also given on the Caterpillar Tractor Co.-LaPlant-Choate Mfg. Co., Inc., distributor organization. The hydraulic bulldozer made by this company is described and illustrated in Form A-112-638.

Copies of the bulletin describing the equipment in which you are particularly interested may be obtained by writing direct to the manufacturer.

CUT Repair Costs in Half
With this new "Simplified" Arc Welding. Eliminates costly delays and expensive replacement parts that cut profits. No more waiting for parts or tearing down equipment with a Hobart on the job. Used by leading contractors the country over.
Free! Valuable booklet on new welding applications . . . write for it.
HOBART
"One of the World's largest Builders of Arc Welders"
HOBART BROTHERS CO., Box CE-61, TROY, OHIO

● Every feature of conventional shovel design that is an obstacle to speed and output has been eliminated in building the A-W BADGER.

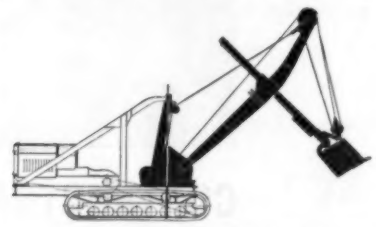
Size of dipper . . . digging speed . . . speed in swinging . . . low center of gravity that makes it possible to use 15 tons of upward pull for ripping through any material . . . ALL contribute to the BADGER'S amazing output.

An investigation will demonstrate conclusively that no full-swing shovel can approach the BADGER on these output-increasing points. Yet the BADGER 1/2-yard Shovel is priced lower than many 3/8-yard shovels. See it perform as a shovel, dragline, trench hoe, pile driver or skimmer before you buy. THE AUSTIN-WESTERN ROAD MACHINERY CO., Aurora, Illinois.

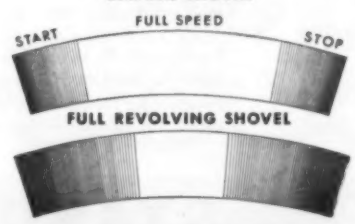
Austin-Western

MOTOR GRADERS · LOADERS · BLADE GRADERS · ELEVATING GRADERS · HYDRAULIC SCRAPERS · CRUSHING AND SCREENING PLANTS · CABLE SCRAPERS · ROLLERS · ROLL-A-PLANES · MOTOR SWEEPERS · BITUMINOUS DISTRIBUTORS · SHOVELS AND CRANES

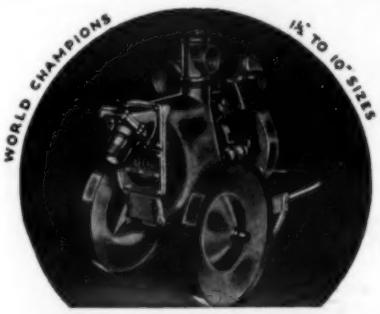
The BADGER'S level full measure is exactly 12 cubic feet. From top of teeth to back of dipper it measures 13-1/2 cubic feet. Heap measure gives a capacity in excess of a full half yard.



The single line maximum pull of the BADGER is 10,000 pounds. Thus the three part line used results in a 30,000 pound pull . . . tremendous digging power.



Diagrams above show greater period of FULL SPEED provided by the BADGER'S faster start and stop. This extra period of *full speed* is possible because the BADGER has no excess load to be brought to full speed, stopped and reversed within the limits of a short swing.



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701 Dublin Ave., Columbus, Ohio

New Catalog Describes Bullgraders, Bulldozers

Everything you want to know about Bucyrus-Erie's new line of hydraulic Bullgraders and bulldozers for use with International TracTracTors is contained in a new 24-page catalog recently issued by the Bucyrus-Erie Co., South Milwaukee, Wis. Construction details and design features are presented in sixty photographs, plus drawings and diagrams, and field action shots show construction features turned into performance on the job.

Complete specifications on Bullgraders and bulldozers for TracTracTors TD-6, TD-9, TD-14 and TD-18 are given in the bulletin, No. BGD-6, copies of which may be obtained by writing direct to the manufacturer and mentioning this item.

Air and Electric Drills

Rotor portable air and electric drills for a variety of hand drilling operations are described in recent literature of the Rotor Tool Co., 17327 Euclid Ave., Cleveland, Ohio.

The air drills, in a wide variety of types and sizes, are powered by a rotor-type motor, have automatic lubrication, a heavy-duty feed screw, oversize bearings, and a new multi-port type governor.

The High Cycle electric drills are operated by three-phase 220-volt electric current, the motor being of the squirrel-cage induction type in which the speed of the motor is governed by the frequency of the power supply, 180 cycles. This motor develops a rotor speed of 10,800 rpm when wound for two poles. These drills are also available in a number of sizes and styles.

Copies of the catalog describing and illustrating Rotor portable drills and other tools may be secured direct from the manufacturer by mentioning this item.

New Dealer for Ransome

The Ransome Concrete Machinery Co., Dunellen, N.J., has appointed The San Antonio Machine & Supply Co., San Antonio, Texas, to handle its complete line of equipment in certain sections of that state.

IMPORTANT TO OPERATORS OF DIESEL-POWERED FLEETS

● With the rapidly increasing use of Diesel power on all types of fleets, maintenance men are finding a new set of problems. For a number of years Standard Oil has maintained a staff of experienced Automotive Engineers throughout the Middle West. Their sole object has been to see that fleet operators take full advantage of the economy afforded by Standard Oil automotive fuels and lubricants. These Engineers are also thoroughly familiar with Diesel engine operation. They are trained and equipped to analyze fuel and lubricant requirements, to locate causes of inefficient operation, and to help you make full use of the economy of Diesel operation.

Regardless of the type of equipment you operate you'll find their service helpful in many ways.

OIL CONSUMPTION CUT 30% ON DIESEL TRUCKS . . .

Just one example of many instances in which truck operators have benefited by Standard Oil Engineering Service is covered by the statement from D. H. Mickelson, Superintendent of Fleet Maintenance at the Mutual Wholesale Food and Supply Company, Minneapolis, which follows:

"Before your Automotive Engineer came to us, we were experiencing considerable difficulty with our Diesel engined trucks. Exhausts were smoky, engines were sludged up, oil consumption was high and power output was erratic. We followed his recommendations and here are the results:

"Exhaust smoke became much lighter, the engines became free of sludge, *oil consumption dropped thirty per cent* and the power output of the engines stabilized and became normal."

CONTRACTORS FIND S. O. ENGINEERS HELP AVOID DELAYS

Diesel-powered construction equipment is not new. Standard Oil Engineers have had many opportunities to work with maintenance men on contractors' equipment and highway department fleets. Their recommendations on Diesel fuel selection and methods of handling it, have eliminated costly fuel pump and injector maintenance problems. On many fleets, their suggestions have made it possible to correct mechanical trouble before equipment is tied up on the job where repairs are costly and difficult to make.

DIESEL PROBLEMS SOLVED FOR BUS OPERATORS . . .

Because Standard Oil Engineers have had experience with equipment on which Diesel engines have been in use for some years, they can be of great help to bus maintenance men who have recently added Diesel-powered buses to their fleets. The conditions under which your buses operate may not be identical to those in other fleets, but these Engineers know Diesel engine characteristics and requirements. This experience has already proved valuable to many bus fleets.

You can reach a Standard Oil Automotive Engineer by writing Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago, Illinois. In Nebraska write Standard Oil Company of Nebraska at Omaha. *Ask to have the Engineer nearest you call.*

Copr. 1941, Standard Oil Company

STANDARD OIL COMPANY (INDIANA)

AUTOMOTIVE ENGINEERING SERVICE — LOWERS MILEAGE COSTS

Types of Compaction Discussed in Report

(*Continued from page 23*)

the largest size studied, 18.00 x 24.00 carrying 60 pounds of air pressure, when loaded to its recommended capacity, produced an elliptical area of contact on a flat firm supporting surface. The distribution of pressure was from zero at the outer edge of the ellipse to a maximum of slightly more than 20 per cent above the amount of inflation. The areas of maximum pressure occurred in two elongated strips, one on each side of the center line of the tire, and may be accounted for by the amount of weight carried by the side walls of the tire. Obviously, the amount of pressure exerted upon any portion of the area of contact over and above the inflation pressure would be a function of the design of the tire, and the number of plies of cords or fabric.

Now, if this loaded tire were supported on a plastic or semi-plastic material such as an uncompacted or partially compacted fill we would expect a certain amount of submergence. The area of contact would increase and the maximum unit pressure would be determined by the resistance of the soil, which may be even less than the inflation pressure in the tire. The construction of such a tire and its cushion of air permits an adjustment of the unit pressure applied to conform with the supporting of the soil within a considerable range above and below the inflation pressure on the tire itself.

A study of these reactions shows why the tire with large diameter and with large cross-section especially designed for earth moving has a compacting effect at greater depth and why it has less tendency to rut and displace the surface of the fill than did its smaller predecessor. These are two reasons why equipment mounted on modern large pneumatic tires will work economically over soft earth fills where similar equipment on small high-pressure tires would be useless. For the same reasons, fills built in layers and subjected to hauling by heavy equipment on large tires require less subsequent compacting than those where similar material is placed by hauling units on small tires.

The limit of the field of usefulness of pneumatic tires can generally be gaged by their tendency to sink into and rut the surface of the fill. In all cases, it is necessary to keep the surface of the fill in a uniform condition, free from ruts or bumps, during the compacting process, if maximum results are to be obtained. Likewise, if high speeds in hauling are to be maintained, it is necessary to keep the surface of haul roads in condition. For these purposes a blade grader or motor grader is generally used.

Compaction by Impact

In Europe several attempts have been made to develop rammers or other machines designed to utilize the principle of impact in compacting earth. One type, namely an explosive rammer, has been tried in this country. It consists essentially of a heavy weighted cylinder in which an internal combustion engine is mounted. The force of the explosion causes it to leap into the air while the operator guides it about the surface to be compacted. This action has won for it the name of "Leaping Lena." Because of the limited area that can be covered per hour in this manner it has not proved very economical for use on large fills. It has produced good results, however, in compacting material used in backfilling trenches and around structures that are not accessible to other types of equipment.

The name "tamping-roller" might imply the importance of impact in their operation. Some specifications defining the minimum speed at which such machines may be operated would seem to be aimed at developing impact. It would appear, however, that within the range of speed usually attained with tractors and rolling tampers, the compacting effect due to speed is small in comparison with that attained by the high unit pressure applied by the feet of the roller.

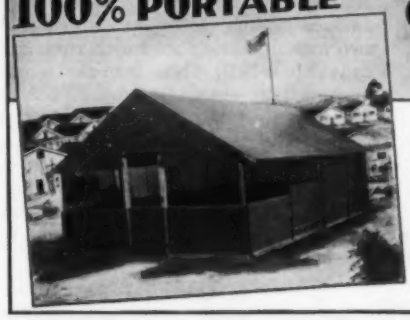
Loose surfaces on fills do not provide the best tractive conditions and it is generally the weight of the tractor rather than the engine horsepower that determines the load that can be hauled. The ratio of engine power to tractor weight in most commercial tractors is such that they can generally pull their maximum load of rolling tampers at about 2½ miles per hour. It might be advisable to suggest a further study of the effect on the time and energy expended in obtaining a given degree of density by decreasing the number or weight of rolling tampers and thereby obtaining a higher speed of operation.

Compaction by Vibration

While vibration is recognized as an effective means of compacting soils, no machines for its use have received ac-

(*Continued on page 44*)

100% PORTABLE



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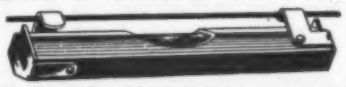


Endorsed and Adopted by Road Builders and Contractors

Level is easily and quickly attached to line. Special feature construction prevents accidental detachment from line. Construction is sturdy, and accuracy guaranteed.

SAND'S LEVEL & TOOL CO.
8531 Gratiot Ave. Detroit, Mich.

C. & E. M. Photo

Good riding qualities were insured by a longitudinal float and the joint finisher's careful straight-edging across the slab.

Doubling Capacity Of Virginia Highway

(*Continued from page* 15)

of about 40 miles. The contractor purchased the batched aggregate delivered at the paver so that each batch was signed for by the man who dumped the batches and cleaned out the trucks at the skip of the MultiFoote 27-E paver. A typical batch ticket picked from those signed during our visit gave the following information regarding the batch:

Sand	1,167 pounds
2-inch to 1-inch gravel	1,314 pounds
1-inch to ¼-inch gravel	886 pounds
Total water in aggregate	17.7 gals. per cu. yd.
Water-cement ratio	0.77

9 per cent moisture in sand
2 per cent moisture in gravel

The cement was brought to the job in bags on semi-trailers from which two men unloaded the bags and lined them up along the forms. Three men dumped 6 bags of cement into the skip of the paver for each batch and one man baled the empty bags.

The batches were mixed one minute in the drum of the paver which ran on boards laid ahead on the first slab poured so as to protect the concrete from the paver crawlers. The paver pulled a wooden platform to catch the drippings from the bucket and one man immediately behind the paver went ahead to sprinkle the grade. He also swept the old slab clear of any aggregate just ahead of the finishing machine so that it would have a smooth surface on which to ride.

There were three pit men just ahead of the Jaeger-Lakewood finisher which dropped a special strike-off ahead of the screed on its first trip over the concrete to strike off the concrete 2 inches below the top for the welded reinforcing mat. This mat was placed by one man on the outside who worked along with the second screed on the finishing machine. Similarly, there was one man on the old slab to keep the grout off the initial slab and who also placed steel plates over the expansion joints in the initial slab to carry the finisher wheels over it without spalling the concrete.

Following the 1940 fashion, the contractor did not lay a pipe line along the shoulder or between the two slabs but instead used two tank trucks, Chevrolets with 1,000-gallon tanks, for hauling water from a creek 4 miles from the center of the job. This paving outfit averaged 1,400 feet of 11-foot 9-7-7-inch slab in 10 hours with a maximum of slightly over 1,600 feet. No vibrating was used at the sides or around the various joints.

Following the mechanical finisher was a 16-foot longitudinal float worked by two men from low bridges. Then came two hand finishers with 10-foot Lakewood aluminum straight-edges which were used to drag excess grout from the surface of the pavement, followed by two men operating a 12-inch rubberized canvas bow belt. These men also worked around both edges, giving the final tool finish against the initial slab and the forms. One finisher cut the joints on both expansion and contraction assemblies, using a steel plate for a guide in finishing and a 24-inch straddle straightedge to be sure that the pavement was finished on both sides of the joint.

Curing

The pavement was cured by placing Sisalkraft paper 13½ feet wide over the slab and down the side, with earth placed on it to keep it from blowing. The paper was rolled on 2 x 4's in 50 and 75-foot lengths and left on the slab for 72 hours. The pavement was opened to traffic when the test beams showed 600 pounds per square inch modulus of rupture, which varied from 7 to 10 days after pouring.

Personnel

The contract for FAP-371-AW1, BW1 for 2.4 miles of concrete pavement was awarded to Hechler Bros., Highland Springs, Va., on its bid of $110,403.59. For the contractor, Roy Hechler was Superintendent, and for the Virginia Department of Highways, W. W. Sanders was Resident Engineer with J. R. Diamond, Senior Highway Engineer, as Inspector.

New Relay Controls Lighting and Power

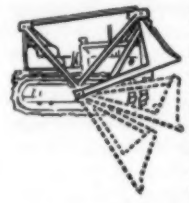
A new photo-electric relay for lighting and power, known as the Sun-Switch, has recently been announced by the United Cinephone Corp., Torrington, Conn. This Sun-Switch is designed to control electrical circuits in accordance with the rise and fall of natural illumination, the user choosing the two lighting levels at which he wishes the load switched on and off, and adjusting the calibrated dials to the corresponding foot-candle readings. Operation is entirely automatic, no resetting being necessary.

This Sun-Switch is housed in weatherproof drawn metal, to make the control rugged and capable of delivering reliable performance. The control circuit uses a Type 921 photo tube having a life expectancy of 20,000 hours, and two Type 6J5 tubes having life expectancies of 5,000 hours. Operation is from 110 volts, 50 or 60 cycles, alternating current.

This control can be used on construction jobs to control lighting for night work and as an auxiliary to cut in another circuit if one circuit fails, as well as for street and highway illumination and for airport beams and lights. Further information on the Sun-Switch may be secured direct from the manufacturer by mentioning this item.

LeTourneau 'Dozers are built for earthmovers who want a unit that can take the punishment of heavy clearing, pioneering rock cuts, etc., with a minimum of time out for repairs. They've made such a hit with successful contractors that for years LeTourneau 'Dozer volume has been the largest in the industry. Here are a few reasons why:

Plow-like digging angle gets blade into ground quickly, rolls big loads with ease. It's a digging fool!



Fast, sure-acting cable control delivers instant power to the blade whether it's 110 or 40 below.

High lift and low drop (as much as 120 inches between extremes in some models) give you plenty of operating range for clearing trees, stumps and rocks or for throwing up levees and banks. Low long drop, possible only with cable control, permits 'Dozer bowl to follow load over steep banks.

Stout all-welded construction gives you great strength with a minimum of weight. LeTourneau Angledozers and Bulldozers are built for use with all size tractors from the D4 up.

Parts and Service—Available in more than 100 cities in the U. S. and 80 foreign countries. Ask your LeTourneau-"Caterpillar" distributor to show you . . . on your own job . . . how these stout fast-acting 'Dozers can save you money . . . NOW.

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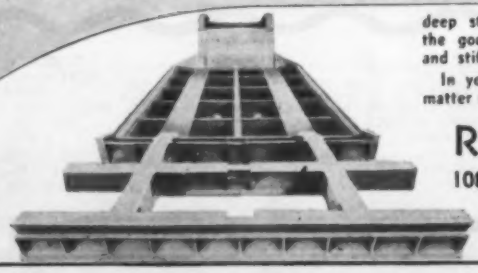
You Get EXTRA "BACKBONE" in a ROGERS TRAILER



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U. S. Engineer Department Photo
The method of fastening the giant tent at Mud Mountain Dam to the anchor ropes across the canyon at the upstream end of the tent.

Dam Core Placed Under Giant Tent

New Use of "Big Top" at Mud Mountain Dam, Wash.; Tent So Arranged It Can Be Raised As Work Progresses

By HENRY W. YOUNG

(*Photo on page 52*)

✦ IN an article on the construction of Mud Mountain Dam, near Enumclaw, Wash., (C. & E. M., May, 1941, pg. 2), mention was made of the huge tent which the Guy F. Atkinson Co., contractor for the project, is employing to protect the impervious earth core material while it is being placed. This material is dried by special equipment from an average moisture content of about 20 per cent to an average of about 16.5 per cent. Obviously, rain falling on the material while it is being placed and compacted would completely defeat the elaborate precautions taken to prepare it; hence the erection of the tent, something which has probably never before been employed for such a purpose by any contractor and which is one of the largest tents ever manufactured for any purpose.

The Tent in Service

The tent is now in use and the core material is being placed under it, as seen in the general view of the work on page 52. The material is lowered to the area by means of two stiffleg derricks located on the canyon rim above the tent. The buckets containing the material are lowered through hatchways in the top of the tent, which can be closed when the derricks are off duty for any considerable time or during heavy storms. For the most part, the work is going along 24 hours a day, an elaborate lighting system being provided for night work.

The tent was made by the Seattle Tent & Awning Co. of Seattle, Wash. Its length is 280 feet and its width 196 feet. Its 14 sections are so put together that it is completely watertight, and it is suspended quite close over the work so that rain or snow cannot drive in on the area from the ends. There are three prepared positions to give the tent the right height above the work, at 150, 200 and 250 feet above the floor of the canyon.

The material of which it is made is standard 10-ounce army duck. The sections were sewn up by machine, and the rope edges and eyelets were hand sewn. With its supporting ropes, the tent weighs 35,000 pounds. The sections were sent to the site by truck and then lowered to the canyon floor, which had been planked, by the derricks. Three days were required to join the sections together and get ready to hoist the tent to the lowest prepared position. This was done by twenty-two Beebe hand hoists.

There are three combined catwalks and gutters at the three levels, the canvas being so fastened on the sides as to discharge into the gutters. These in turn slope to each end of the work where standpipes drop the water to the rock-fill portions of the dam. The gutters are of wood, 3 feet 6 inches wide, and follow the contours of the walls, to which they are grouted. Above the gutters are the guys and winches to anchor the eaves of the tent to the gutters.

The whole thing is supported from overhead guys by means of eight 15-ton Beebe hand-operated winches on top of the canyon walls. In raising, the work of the men on the winches is coordinated by a megaphone system and emergency stops by pistols firing blank cartridges.

The edges of the tent on the sides are drawn in and held by side ropes anchored to the rock. These side ropes carry a series of pulley blocks, with a like number of blocks fastened to the sections of the tent. As seen in one of the detail photographs, a cable laced through the two sets of blocks draws in the edge of any section or eases up on it as desired. Slack on each section is taken up by one of the 24-inch 5-ton hand winches.

For the ends of the tent, anchor ropes are stretched across the canyon carrying pulley blocks at intervals opposing another set of blocks on the tent edge. A rope is then threaded through the two sets of blocks and any desired tension is maintained.

Preparations for Raising

Once erected, the tent has to be maintained in operable position at all times, with the same slope, even during raising from one level to the next. Moreover, the canyon is not of the same width at the various stations. It gets wider as it goes up. Therefore, extra canvas is provided and stored, ready to add to the eaves of the tent as it is raised to a new position. For raising from one position to the next, new ropes are attached to the gutter above and to a second set of blocks on the canvas. These will be tightened and the original set slackened in proportion as the tent is raised to the higher levels.

U. S. Engineer Department Photo
Anchoring the tent to the canyon wall at Mud Mountain Dam.

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FOR ECONOMY in all earth-moving jobs, it pays to match the job with the right size Killefer *revolving* Scraper. There is a size to match the power of any tractor from the smallest wheel-type to the largest 60 H. P. track-type. Tractor-controlled, durable, and well constructed. The bowl revolves—it dumps forward or backward... cuts thick or thin... and spreads thick or thin. Match your job and your tractors with a Killefer. Write for information.

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7 SIZES
RANGE in capacity from 18 to 65 cu. ft., in power requirements from 15 to 60 H. P.

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Two Routes to Alaska Under Consideration

(*Continued from page 24*)

1938, provided for the appointment by the President of a new commission, to be known as the Alaskan International Highway Commission, to cooperate and communicate with a similar commission in Canada for further study of the project and the preparation of a report on the extent and results of their activities. Shortly after the present Commissioners were appointed, Chairman Magnuson called a meeting of three of the Commissioners who were then in the state of Washington. At this meeting were present also Col. Louis Johnson, Assistant Secretary of War, and Col. John Monroe Johnson, Assistant Secretary of Commerce, who were returning by plane from Alaska where they had inspected some portions of the highway route which had been proposed. They reported their flight over the northern section of the route and both seemed wholly favorable to the proposed construction.

Further study, conferences with the Canadian Commission, and reconnaissance flights were made, and in April, 1940, the Commission made its report to the President. This report furnished the basis for this article.

The total distance from Seattle to Fairbanks is about 2,250 miles, of which about 880 miles of good gravel road is already in existence between Seattle and Hazelton, B. C., an additional 50 miles beyond Hazelton, and 91 miles of good road from Fairbanks toward Dawson, leaving about 180 miles yet to be built in Alaska and approximately 1,000 miles in Canada. In other words, the route is about 48 per cent constructed.

It is generally agreed to use the present Trans-Canada Highway from Vancouver north to Ashcroft, B. C., and the Caribou Highway, already in existence, from there to Prince George. From this point on two general routes are under discussion. The westerly route, known as Route A, is that favored by the United States Commissioners, while Route B, following a more easterly course, is rather more favored by the Canadians. Both Commissions, however, recognize that the choice of route must be mutually beneficial and not determined by local prejudices and considerations.

Proposed Route A

Route A from Prince George may be divided into three sections: Prince George to a crossing of the Stikine River or its tributary, Tanzilla River; from the Stikine River crossing to the town of Atlin and thence northward around Atlin Lake to Whitehorse; and from Whitehorse to Dawson and the Alaska-Yukon boundary where it would join up with a main highway in Alaska leading to Fairbanks.

From Prince George northwestward there is a fair type of gravel road leading to Hazelton, 305 miles distant. The problem in connection with the first or Prince George section of the highway is to find the best route to the crossing of the Stikine River as close to Telegraph Creek as good construction will warrant. Because several mountain ranges must be crossed en route, the lowest passes must be considered. Also available information indicates that the farther from the coast the road is laid out, the less snowfall it will encounter at the same elevation. Any of the slightly varying alternates for Route A would incorporate a part or all of the existing Prince George-Hazleton road.

From the crossing of the Stikine River northerly and westerly to Atlin, three alternate routes present themselves, the selection of the lowest pass south of Atlin being an important consideration. From Atlin the route runs north along Atlin Lake to the Yukon boundary, then around the north end of Tagish Lake to Carcross, and follows the present road which parallels the White Pass and Yukon Railroad to Whitehorse.

From Whitehorse to Dawson and the Alaska boundary, a choice of three alternate routes has been proposed. The first of these follows the present tractor road as far as the Lewes River, then carries on, crossing several rivers and joining the present trail to Dawson and utilizing the existing road westward to the Alaska boundary near the Fortymile district. The advantage of this route is that it goes direct to Dawson from Whitehorse entirely within Canadian territory. The second alternate also follows the present tractor road but keeps on the west side of the Lewes and Yukon Rivers instead of crossing them, then crosses the White River en route to West Dawson, thence westward along the present road to the boundary. This route presents the advantage of crossing only one major stream instead of five. The third possibility via Kluane Lake offers greater scenic attractions.

Enough information is already at hand to prove conclusively the feasibility of constructing a highway along the general course of Route A, but further field investigations must be made before deciding on the best exact location.

The U. S. Commission favors this Route A from Prince George via Hazelton or Stuart Lake to Whitehorse and thence via Kluane Lake and the upper Tanana River to Fairbanks for several reasons. It permits shorter branch roads being built as possible highway outlets to towns along the coast of southeastern Alaska; it would aid in the mining development along the upper Tanana River in Alaska; a highway could be constructed from the Tanana River northeast to Dawson, thereby giving Dawson access to the highway and aid in the mining development of the Fortymile region in Alaska; and this route is more scenic.

Proposed Route B

From the Prince George district north, Route B, or the easterly route, follows an extension of the Rocky Mountain trench extending from the Montana-British Columbia border northwesterly to the Yukon River Basin. The floor of this trough has an elevation of about 2,000 feet above sea level at its lowest point and only 3,150 feet at its highest

(*Concluded on next page*)

Baker Bulldozer on Harris County, Texas, flood control project.

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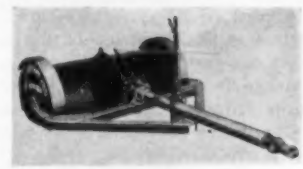

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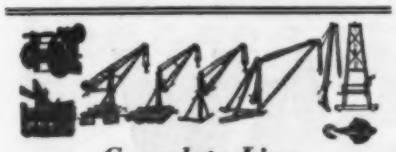

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Map of the proposed Alaskan International Highway through British Columbia to Alaska, showing the alternate routes under consideration.

Alaska Road Needed; Question of Finance

(*Continued from preceding page*)

point. It follows an almost perfect great circle course. Commencing at Prince George, there are two possible routes to Finlay Forks, an old Hudson Bay Trading Post 170 miles distant. The first would follow an existing gravel road north for 32 miles to its end at Summit Lake and the new construction would be required to extend the road to Finlay Forks, following the Crooked, Pack and Parsnip Rivers. The other route to Finlay Forks would use a partially completed road which branches off from the Prince George-Hazelton road about 70 miles from Prince George, and then extends northerly through Fort St. James. A 55-mile extension of this road, already begun, will bring it to Finlay Forks, a total of approximately 265 miles from Prince George by this route. Finlay Forks will soon be connected by road to Hudson Hope, to the east, which is already connected by highway with Edmonton.

From Finlay Forks Route B, extending in a general northwesterly direction, follows close to the Finlay River to Sifton Pass, a distance of about 187 miles, and then continues generally northwest to the British Columbia-Yukon boundary, about 225 miles from Sifton Pass; thence northwest for about 170 miles, then to and along the Pelly River, finally crossing it and on to Selkirk where it meets the existing road between Whitehorse and Dawson, Yukon Territory. From Dawson, the route follows the existing road which extends west about 65 miles to the Alaska boundary. If Route B is followed, connection could be made from the Alaska boundary to an advantageous point on the Richardson Highway in Alaska and thence to Fairbanks.

Because little authentic information was available on Route B, the main field investigations by the Canadian Commission during the 1939 season consisted of reconnaissance work along this route. The information obtained shows that this route is feasible in every respect. Climatic conditions are favorable, precipitation is low, both winter and summer, construction would be comparatively easy, and a remarkably straight location is possible practically the entire distance. A main item of cost on this route is its remoteness from railheads or point of supplies, although some of the rivers might be used to advantage as transportation arteries.

The reason the Canadian Commission favors this route is that it is a shorter distance to Dawson, it has fewer and lower passes than Route A, it would be easier to construct and therefore less expensive, and it would afford a route into Dawson entirely within Canadian territory.

Financing

In the report of the special Commission of 1933, it was estimated that the cost of construction of such a highway would be about $13,960,000, of which about $1,970,000 would be required for construction in Alaska and the remainder for work in Canada. This estimate, considered too low by some highway experts, was based on a 24-foot roadway with a gravel surface 16 feet wide, and included all necessary ditching, culverts and bridges. It was proposed at that time that the work be carried on by the stage-construction process, making the initial standard no higher than required by the estimated traffic, with higher standards provided later as required and as funds became available.

Negotiations between the United States and Canadian Commissions have not yet reached the stage of formal discussions on the financing of this project. The Canadian Government is at present primarily concerned with its war effort, and perhaps would hesitate to invest such a sum in the construction of this highway at this time. If this highway is as important to U. S. defense as many experts believe, it would be worth while for the United States to make some arrangement for advancing the money to Canada and get on with the construction of the highway.

The immediate benefits of such an arrangement would be that, if the United States aids in the financing of the highway, it would probably also have a fair share in furnishing the equipment and materials and in awarding the contracts for its construction. It would provide, as soon as possible, the advantage of an overland route to Alaska as an aid to its defense, and both the United States and Canada would share the long-range benefit of the opening up and development of vast territories rich in natural resources.

Two New B-E Dealers

The Bucyrus-Erie Co., South Milwaukee, Wis., announced recently the appointment of Dow & Co., of Buffalo, N. Y., and the J. D. Adams Co., Billings, Mont., as distributors for B-E ⅜-yard to 2½-yard shovels, draglines, clamshell and lifting cranes.

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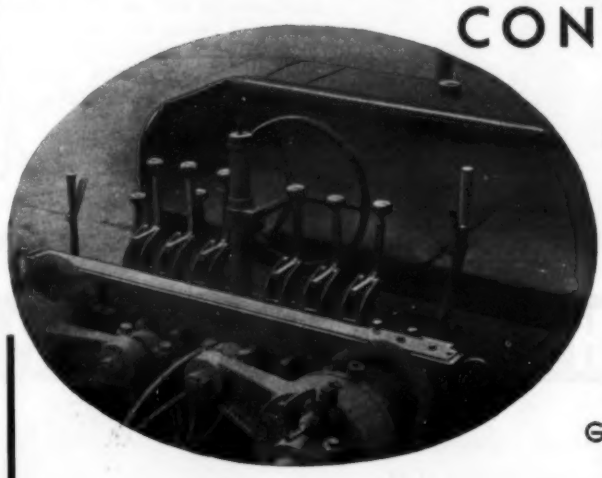

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Also: all-gear driven double drive; full revolving circle; wide range of adjustment; diesel or gasoline engine; box-type frame; wide front axle; leaning front wheels; and other features. Let us send you full particulars.

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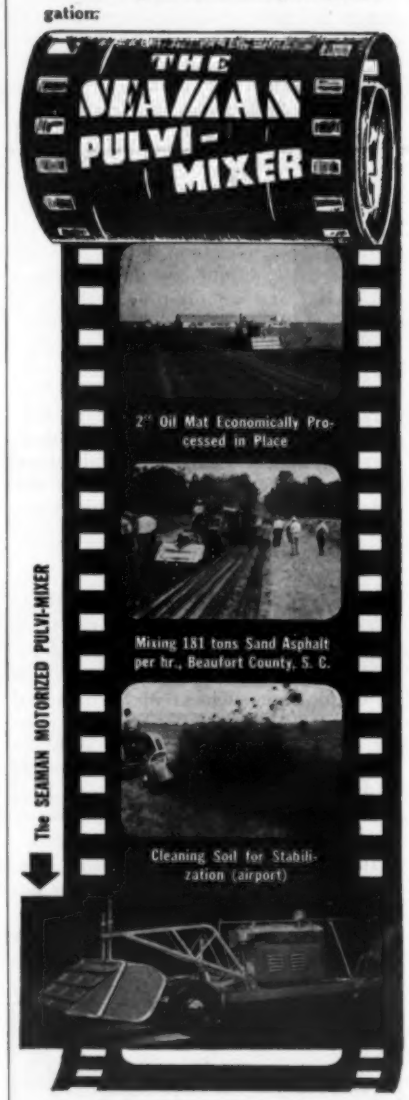
Bigger profits and quicker, more efficient and better operation demand your investigation: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Mixing 181 tons Sand Asphalt per hr., Beaufort County, S. C.
Cleaning Soil for Stabilization (airport)
The SEAMAN MOTORIZED PULVI-MIXER

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Washington County Equipment Roster

(*Continued from page 28*)

with the usual obsolete equipment being replaced as rapidly as finances will permit. The list of the major mechanical equipment follows:

1 Insley ½-yard power shovel
2 Bay City ⅜-yard power shovels
2 Adams No. 50 12-foot motor patrol graders
1 Gallon 10-foot motor patrol grader
2 International I-12 mowers with 5-foot bars
2 Huber BG mowers with 5-foot bars
3 FWD trucks with Willett underbody blades and dump bodies
1 FWD dump truck
13 International 2 to 3-ton trucks with dump bodies
1 International 2 to 3-ton truck with stake body
1 Chevrolet 1½-ton truck with stake body
1 International ½-ton pick-up truck
3 Ford V-8 1½-ton dump trucks
1 Dodge 1½-ton dump truck
1 Ford V-8 1½-ton stake-body truck for the bridge crew
1 Gallon pulled grader with 10-foot blade
2 Adams pulled graders with 10-foot blades
1 T-40 International tractor
1 T-40 International tractor with Bucyrus-Erie bulldozer, and 3½-yd Bucyrus-Erie hydraulic scraper
1 Cletrac 60-hp tractor
1 TD-18 International tractor
2 Jaeger 1-bag mixers
1 Jaeger 2-bag mixer
1 Wonder 2-bag mixer
1 Littleford asphalt kettle
4 Jaeger 3-inch Sure Prime pumps
1 Buhl 90-cubic foot air compressor
1 Fordson 105-cubic foot air compressor
1 Roger Bros. 9-ton equipment trailer
1 Shop-made 2-wheel pole trailer
1 Calcium-chloride spreader
1 Mud Hen diaphragm pump
1 7-foot rotary scraper
1 Hobart electric 300-ampere electric welder for bridge work
1 Chevrolet sedan for the County Engineer
1 Chevrolet suburban delivery truck for survey parties
1 Plymouth sedan for the Deputy County Engineer

The county owns no snow plows although a few years ago several drag plows, for attaching to trucks, were built and helped materially in snow removal. The motor patrols and bulldozers are also used for snow removal where necessary. In one storm in February, 1940, there was as much as 10 inches of snow on the county roads to be removed with this equipment.

County Bridge Maintenance

Washington County has 601 bridges, varying from 50 to 175 feet in length and with 14 to 16-foot roadways. Of these bridges, twenty-nine are covered bridges, many of them with corrugated metal roof and wood siding. Many of the larger metal culverts beneath county roads are old boilers but the available supply of these has been practically exhausted and Washington County has only three left in its Masonic Park storage yard. In many instances multiple corrugated-metal culvert installations have been already used in place of the old larger culverts which required excessive head room.

Heavy-Duty Bulldozer

The Model HB-95 Heil Quality-Built bulldozer for mounting on a Model FG Cletrac is designed for the tough jobs of bulldozing, such as in hard-packed soil where plenty of down pressure on the blade is required. With a blade length of 124 inches and a blade height of 44 inches, it is claimed that this Heil bulldozer is capable of handling many yards of dirt in fast time.

Its construction and operating features include hydraulic power for up and down movements, floating and holding the blade, with a non-settle check valve to hold the blade in elevated position; large-diameter hydraulic cylinders permitting the use of low hydraulic operating pressures; reversible three-piece hard-faced cutting edge; hydraulic and mechanical equalization to compensate for uneven traction; and all thrusts transmitted to the tractor frame through the dead axle.

Further information on these Heil bulldozers, as well as on the other equipment in the Heil line, including trailbuilders, cable and hydraulic scrapers, and sheepsfoot tamping rollers, may be secured direct from the Heil Co., Milwaukee, Wis.

C. & E. M. Photo

Overhauling an International I-12 mower at the Washington County garage.

Compact Air Compressor Described in New Bulletin

"A lot of compressor in a very small package" is the way Schramm, Inc., West Chester, Penna., describes its Model No. 20. This is a complete self-contained unit consisting of an engine block, with two power and two air cylinders, minus any belts, gears, or other forms of transmission, with a displacement of 30 cfm and an actual air delivery of 20 cfm at 100 pounds pressure. It is available mounted on skids, a two-wheel trailer or on a low-wheeled pneumatic-tired shop truck.

Copies of Bulletin 4120, which describes and illustrates the Model No. 20 compressor in detail, may be obtained by writing direct to the manufacturer and mentioning this item.

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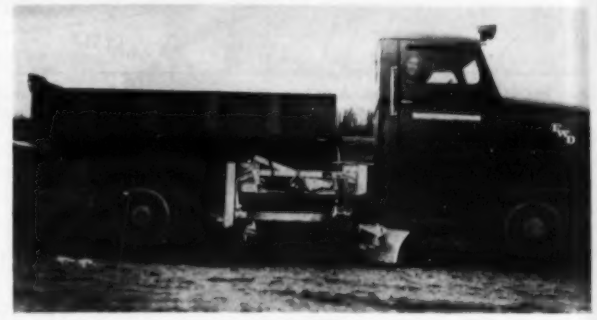

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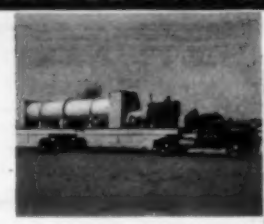

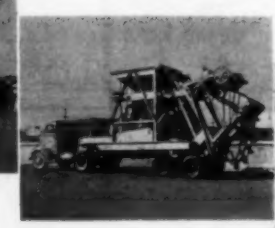

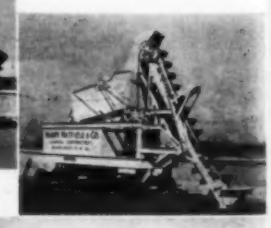

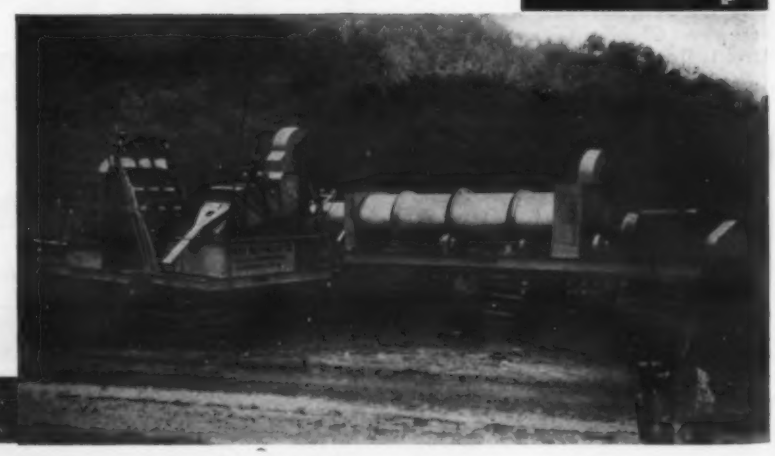

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Unloading scrap iron with a Trackson PDG pipe layer, one of the many uses to which these tractor side booms may be put.

Pipe Layers Applied To Many Other Uses

Contractors and highway equipment men in state and county highway garage yards are finding many uses for a piece of tractor equipment originally designed and used up to now mainly for handling and laying pipe. This piece of equipment is the pipe layer or tractor side boom which not only has high lifting capacity in proportion to its weight but can also carry loads at tractor speeds.

The Trackson pipe layer shown in the illustration is one of the models made by the Trackson Co., Milwaukee, Wis., and is owned by the American Iron & Metal Co. of Casper, Wyo., which uses it for a variety of loading and unloading jobs. These pipe layers are available in several models for several sizes of track-type tractors ranging from the 30 to 35-hp sizes to the big Caterpillar D8 model. It is stated that a D8 and Trackson pipe layer can lift and walk away with a load of 30 tons or more.

In addition to its use for pipe laying on the many highway and airport drainage jobs in connection with the defense program, there are a number of these units in use for a wide variety of jobs on large defense-construction projects.

Further information on these Trackson pipe layers may be secured by those interested direct from the manufacturer by referring to this item.

Prize-Winning Bridges Announced by A.I.S.C.

(*Continued from page 4*)

Bridge over Navesink River between Locust Point and Rumson, N. J. In addition, the Jury of Award selected seven other bridges for honorable mention.

The Susquehanna River Bridge, winner of the Class A award, was built for the Maryland State Roads Commission by the Bethlehem Steel Co., with the J. E. Greiner Co. as engineers. The structure, costing $4,085,000, is 7,618 feet in length from abutment to abutment. Honorable mention in this class was given to the $1,730,000 Ohio River Bridge at Owensboro, Ky., designed by Modjeski & Masters and built by the Hunter Steel Co. for the Owensboro Bridge Commission; to the Pennsylvania Avenue Bridge over the Anacostia River in the District of Columbia, for which Parsons, Klapp, Brinckerhoff & Douglas were the engineers, McKim, Mead & White, architects, and Bethlehem Steel Co., the fabricator. The structure cost $2,000,000 and has nine spans, each 154 feet long.

Dunnings Creek Bridge, winner of the Class B award, is a 480-foot structure costing $260,000. It was designed by Parsons, Klapp, Brinckerhoff & Douglas and built by the American Bridge Co. for the Pennsylvania Turnpike Commission. Honorable mention in this class went to the Lakefront Road Viaduct in Cleveland, Ohio, designed and built under the supervision of John O. McWilliams, County Engineer of Cuyahoga County, and fabricated and erected by the Bethlehem Steel Co.

The most beautiful bridge in Class C was judged to be the Klamath River Bridge at Orleans, Calif., costing $139,900, including approaches. The engineers were C. H. Purcell, State Highway Engineer, and F. W. Panhorst, Bridge Engineer for the California Department of Public Works, and the fabricator the Judson-Pacific Co. The main suspension span is 360 feet and the total bridge length, 665 feet. Honorable mention in this class went to the Fort Littleton Interchange Bridge on the Pennsylvania Turnpike, designed by the Pennsylvania Turnpike Commission and built by the Bethlehem Steel Co., and to the Flatbush Avenue Bridge on the Belt Parkway, Brooklyn, N. Y., designed by Madigan-Hyland and built by the Harris Structural Steel Co. for the New York City Department of Parks.

In the movable bridge class, the award went to the Oceanic Bridge over the Navesink River in New Jersey, for which Howard, Needles, Tammen & Bergendoff, with Morris Goodkind, were the consulting engineers and the Bethlehem Steel Co., fabricator and erector. The owner is Monmouth County, N. J., and the bridge is the bascule span type, 98 feet center to center of bearings. Honorable mention in this class was given to the Cambridge Creek Bridge, at Cambridge, Md., designed by the Henry G. Perring Co., and erected by the American Bridge Co., for the Maryland State Roads Commission, and to the Erie Avenue Bascule Bridge over Black Run, Lorain, Ohio, designed by J. W. Watson & Associates and built by the Mt. Vernon Bridge Co. for the Lorain County Commissioners.

The Jury of Award consisted of Prof. Francis P. Witmer, Department of Civil Engineering, University of Pennsylvania; Prof. Edward J. Squire, Department of Civil Engineering, Polytechnic Institute of Brooklyn, N. Y.; John A. Thompson, Architect; W. Stanwood Phillips, Architect; and Waldo G. Bowman, Editor, *Engineering News-Record*.

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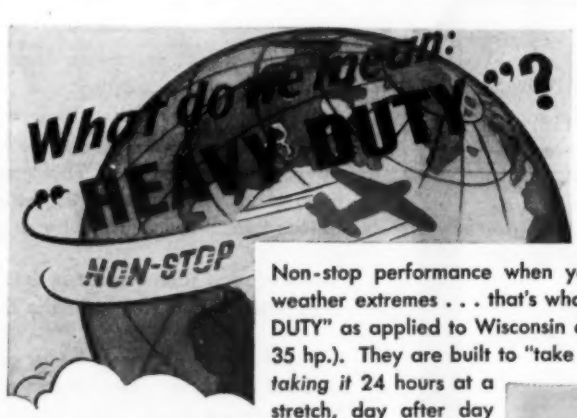

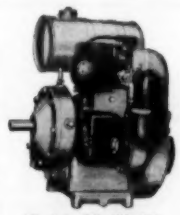

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Road Oil Distributor, equipped with single cyl. Wisconsin Air-Cooled Engine.

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World's Largest Builders of Heavy-Duty Air-Cooled Engines

No telling where you'll find this Hough Shovel and WM tractor working. Solves no end of digging, loading, leveling and backfilling problems . . . at a new low in cost.

In MINING—shown above loading ore into trucks for Lange Bros., Tehachcapi, California.

In QUARRY and GRAVEL PITS—Ebenezer Township, S. C., uses this outfit to load trucks in a gravel pit.

In OIL FIELDS—here it builds a fire wall on Gulf Refining Co. lease near Elmo, Illinois. Also used for digging slush pits.

In CONTRACTING—for basement work, road-building, general contracting, etc.—an ideal unit. Here it excavates for a school foundation.

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Soil Compaction

(*Continued from page 37*)

ceptance in this country as primary compacting units. The principle, however, is illustrated by the action of track-type tractors and track-type trailers. Such machines carry considerable weight because their tracks provide a large area of contact with the ground surface, and their unit pressure is much less than any other type of equipment of comparable size and weight. Because they operate over jointed tracks they set up a vibration in the soil in a manner not equalled by other types of hauling equipment. Since track-type tractors, operating without accessory equipment, have proved very successful in compacting earth embankments where the effect of vibration was most desired, their functions and operation are discussed under this heading.

The compacting of a granular soil is an act of readjusting the position of the soil particles in relation to each other so that the finer particles slide into the voids between the larger ones, thus causing the mass to occupy less space. That is the function of vibration and the element of time required for the particles to readjust themselves has been called, for want of a better term, the "soil lag".

Vibration is the most effective means for compacting cohesionless soils such as sand and gravel and is also effective in soils composed of a wide range of particle sizes with some moist cohesive material so as to compare in consistency with a concrete mixture having a very small slump. In such soils, vibration increases the density to a much greater depth than does the application of weight only.

Track-type equipment applies a load combined with vibration during that interval of time required for the machine to travel the length of the ground contact. This provides for the soil lag. Tractors, when developing a drawbar pull at or near the maximum that tractive conditions will permit, will develop a slight slippage that causes a troweling action which helps compaction near the surface. The unit pressures developed with this type of equipment are less than for other kinds and the wide area of contact develops resistance in plastic soils. For these reasons such equipment will function under conditions that would render other types useless. This reduces to a minimum the delays caused by soil or weather conditions and the added cost resulting therefrom.

In many cases, material hauled by this type of equipment and spread in layers over which subsequent loads are hauled develops sufficient density to resist any further attempt at compaction. Practically all types of soil when thus handled will require less subsequent compaction to obtain the desired density. The maximum compacting effect of hauling equipment results when the various hauling units are routed over different courses on successive trips so that the whole area of each layer receives, as nearly as possible, the same treatment. The depth to which the compacting force of track-type equipment is effective causes an increase in density in layers below the one traveled on and tends to produce a fair degree of uniformity in the fill even when the distribution of the loads over the entire area of each layer is not entirely uniform.

Mixing Diverse Soils

Highway embankments are generally made of materials obtained from cuts or from adjacent borrow areas and the selection of soils for their uniformity and suitability is practiced to a very limited degree. For this reason a wide range of soil types and conditions may be encountered on any road project of considerable length. It is impractical to select specialized equipment for the handling of each type. Therefore, it is highly advisable to adopt methods and practices that will permit the use of a minimum number of kinds of construction equipment as well as to select equipment that has the widest range of utility. While these rules apply particularly to excavating, hauling and placing material they should also be considered in reference to compacting.

After these various soil types have been placed in the fill they may be subjected to seasonal changes in moisture and temperature and to different loading, according to their position in the embankment. In that portion at or near the top of the fill and especially under flexible surfaces, the effect of concentrated moving loads will be much greater than that of the static load. As the depth below the surface increases, the effect of the moving load decreases and the effect of the weight of the superimposed fill increases until at the bottom of high embankments special attention must be paid to obtain stability against the static load.

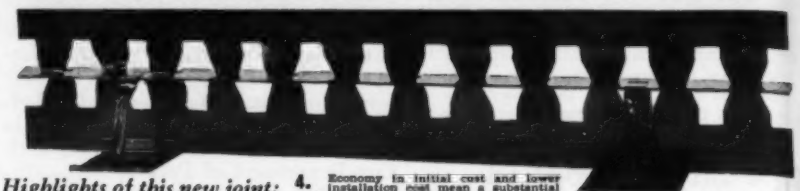
It is the middle zone between the portion which carries the concentrated moving loads and the lower zone carrying great static loads that forms the greatest volume of highway embankment and requires less special treatment than the others. The upper zone not only carries the traffic loads but is also more subject to changes in stability due to seasonal conditions. This often calls for special treatment either by placing selected material in the top of the fill or by some form of subgrade stabilization. In any case it calls for a layer of uniform supporting power and uniform stability.

Soil Stabilization

In any type of stabilization the object

(*Concluded on next page*)

The New KEYLODE Contraction Joint—



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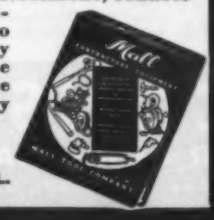

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Soil Compaction

(*Continued from preceding page*)

should be to obtain a layer of uniform thickness, and uniformity should be the watchword in all the operations of proportioning, mixing and compacting. For processing the soil, the engineer first turned to agricultural implements such as heavy spring-tooth harrows and disk harrows. With slight modifications these tools are still widely used.

While such implements are not strictly compacting machines, their operation is preliminary to compaction and they aid materially in obtaining density and stability. Their action therefore should be considered. Since they were developed as agricultural tools it would seem that further investigations and tests might result in improvements that would increase their efficiency in soil mixing. One needed improvement is some form of depth gage or method of control of the penetration of the equipment into various soils.

Since disk rotation is an important factor in mixing soils with disk harrows, more should be known about the effect on rotation caused by the concavity of the disk, the disk angle with reference to the line of travel, and the speed of operation in various types of soil. It is generally considered that the rotation of the disk is retarded when the depth of penetration exceeds approximately one-third the diameter of the disk. This limits the thickness of layers to about 10 inches, when greatest efficiency is desired, with present day disk harrows.

More information should be made available regarding the use and shape of spades for spring-tooth harrows to obtain the best mixing results in various types of soil. Machines of this type as they are now built are also limited to a penetration of not more than 10 inches.

When the depth of the course to be stabilized is greater than 10 inches, it is advisable to treat it as two layers, each being mixed, spread and compacted separately. Blade graders and motor graders are used to loosen the surface if treatment is to be given to the surface layer of a fill that has been compacted. They are also an aid in pulverizing and mixing. The compacting is usually accomplished by sheepsfoot tampers. These machines generally leave a thin layer of uncompacted soil which must be bladed off to form a part of the surfacing material or must be bonded into the foundation by a smooth road roller or by a rubber-tired roller. This latter machine has proved very successful in finishing the top of foundation courses on which thin flexible pavements are to be laid. Its action may be attributed to the rubbing or troweling action caused by the flexing of the tires. There is not enough known regarding the proper weight, size of tire and inflation pressure necessary to obtain the best results.

Conclusion

This so-called progress report brings up many questions for discussion as the Subcommittee evidently feels that there is much yet to be learned in the important subject of the compaction of embankments or soil layers. This first report of Subcommittee No. 2 on Equipment, Its Application and Uses very definitely focuses attention on this subject in an endeavor to secure more effective use of present equipment, improvements in existing machines, and the development of new machines which may result in greater economy in the compaction of earth embankments and foundations.

Free Field-Trial Test Of Dry Developer Paper

A new type of sensitized paper for use with white-print dry-developer or ammonia-vapor dry-developer machines for reproducing engineering drawings has been developed by The Frederick Post Co. and is now in its final tests. The new paper embodies a number of improvements, including a 50 per cent rag-content bond; two speeds in sensitivity, regular and fast; and two colors, a deep royal blue and Post red.

It is claimed that this new paper prints to a cleaner, whiter background and at the same time leaves all lines in deeply colored contrast. Special emphasis is placed on the crisp detail of fine lines.

To owners of ammonia-vapor machines who care to cooperate in the final "field-trial" test under "on-the-job" conditions, The Frederick Post Co. will deliver free a $2.50 stock of this VAPOpaper, asking only that a brief report be made on its performance. Interested state and county engineers and contractors owning dry developer machines may secure a free trial stock of VAPOpaper by sending the model or serial number of their machine with their request direct to The Frederick Post Co., Box 803, Chicago, Ill., and mentioning this magazine.

Small Rubber Insets Aid Dump Body Use

Two small pieces of special rubber replace heavy chains and springs in the lift links on the new Super hydraulic hoists made by the Anthony Co., Inc., Streator, Ill. These insets act to cushion the hoist when dumping a load and eliminate "kick-back" when spreading gravel or dumping.

Anthony Super hydraulic hoists are controlled from the dash by a conveniently located button, similar to the engine choke, which is within easy reach of the driver even when he is standing on the running board. This hoist also makes possible a low loading height, as much as 3 inches lower on the chassis frame with only 11 inches between the bottom of the body and the frame.

The latest Anthony catalog, Form 8LC-241, contains 8 pages of worthwhile information for contractors and highway engineers and special information on High Tipper hoists and the special building material body, Model D18, which has hinged sides to permit loading or unloading from either side of the standard 78-inch body as well as the usual use of the gate for dumping and spreading.

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Avoid Legal Pitfalls

These brief abstracts of court decisions may aid you. Local ordinances or state laws may alter conditions in your community. If in doubt consult your own attorney.

Edited by A. L. H. STREET, Attorney-at-Law.

Splitting Profits With an Association

It is not always that the courts agree upon what is legal and what is not, but they do not seem to be at odds with each other on the point that a by-law of a contractors' association which assesses each member a percentage of profits made from contracts secured by him, no matter how small the percentage, is void as being contrary to public policy.

An association adopted a by-law which fixed the "ante" at one-half of one per cent of the gross amount of each contract secured in the association's territory. Later the fee was cut in half. That put a contracting firm in debt to the association for $2,192.94 on the gross figure paid the firm for building a dam for Uncle Sam. The fee not being paid, the association sued, and lost the suit before the Superior Court of Pennsylvania (Constructors Association v. Seeds, 15 Atl. 2d, 467.) The court said:

"It seems quite apparent that such a by-law has a direct tendency to injure the public and thus affect competitive bidding. The percentage charged all members is obviously not a payment in the form of dues for services rendered by the association, but gives to such members an interest in the contract as it results in making a distribution to them of a portion of the contract price, If the percentage were larger, the effect thereof would become more evident. The principle however the same."

The court cites similar decisions reached by the appellate courts of Kansas and Kentucky.

Adjusting Job Disputes By Arbitration Board

A government contract provided that an official board should have power to determine disputes arising under the contract. This provision, therefore, made final the determination by the board as to the amount the contractor was entitled to as pay for extras, ruled the United States District Court for the District of Delaware in the case of English Construction Co. v. United States, 29 Fed. Supp. 526.

The court also decided that the board's determination that the contractor was responsible for delay in completing the job was the last word on that question, there being nothing to show that the decision was influenced by fraud or mistake.

Where the parties to a contract agree upon an arbitrator of such disputes, and there is no fraud or mistake to impugn his decision, the court adopts the view that the decision ought not to be disturbed in a suit at law, even though a judge might reach a different conclusion from that reached by the arbitrator.

A Vulnerable Spot Often Overlooked

No contractor should fail to assure himself that he has done all that is necessary to legalize the contracts that he makes. In many states, failure to secure a license may prove fatal when he attempts to enforce a contract. In other states, the same result may follow from failure to register the name of his business.

The importance of this precaution is illustrated by what happened in the case of Colbert v. Ashland Construction Co., 11 S. E. 2d, 612. The plaintiff, doing an unincorporated business under the name "Virginia Construction Co.", sued to collect nearly $4,000 remaining due on a $15,000 job. He lost the suit, not because he had not done the work according to contract, but because he had failed to file a certificate with the County Register of Deeds, showing his name and address as owner of the business.

Upholding a statute which requires certificates to be filed in such cases, where business is done under an assumed or fictitious name, the Virginia Supreme Court of Appeals notes that the purpose of the statute is to enable prospective creditors, etc., to ascertain the ownership of an unincorporated business not done in the name of the owner or owners. And the court finds that the drastic penalty—fine or imprisonment or both—prescribed by the law for failure to comply with the requirement shows that the Virginia Legislature intended that contracts made by those not complying with the law should be absolutely void, although the law does not specifically declare them to be void.

Assigning Contract Proceeds

When a highway job gets into the red, there is often strenuous competition among subcontractors, material men, banks, sureties and other creditors of the general contractor for priority in payment out of available funds. In such cases, the rights of one claim under an assignment of the general contractor's claim for unpaid proceeds of the job is apt to be the subject of controversy. That is what happened in the case of Standard Accident Insurance Co. v. Federal National Bank, 115 Fed. 2d, 34, decided by the U. S. Circuit Court of Appeals, Tenth Circuit.

The contractor on a state highway contract in Oklahoma assigned its claim to a bank and a chief of accounts, acting on behalf of the State Highway Commission, indorsed upon the assignment a certificate that the claim had been audited and allowed by the Commission and that "warrant, when payable, will be issued direct to assignee."

The court decided: If the indorsement be treated as an acceptance by the State Highway Commission of the assignment, it constituted a contract by the Commission to pay the claim to the assignee, free from any claim for deduction that might have been made from the contract price as against the contractor. But a Commission is not to be deemed to have intended to thus preclude itself from asserting against an assignee all rights that could be asserted against the contractor, unless the circumstances compel a conclusion that such was the intention of the Commission. The chief of accounts could not make a contract that would bind the Commission. The certificate indorsed by him should be deemed to have no force beyond mere acknowledgement by the Commission of notice that the contractor's claim had been assigned.

Unfulfilled Contracts

A suit by a tunnel contractor against a water district which took over an uncompleted job gave the United States Circuit Court of Appeals, Ninth Circuit, occasion for deciding several legal propositions that are of interest to every contractor. (Wenzel & Henoch Construction Co. v. Metropolitan Water District, 115 Fed. 2d, 25.)

Here is a summary of the principal points decided: The contract was so worded as to make the decision of the District's engineer that the contractor was guilty of unnecessary and unreasonable delay binding upon the contractor, as ground for taking over the job, in the absence of any showing that the engineer acted fraudulently. The circumstances were such that the contractor could not claim that the District had misrepresented underground conditions that would be encountered in driving the tunnel. Failure of the District to make progress payments when due, until satisfied as to the status of available funds, did not constitute such breach of the contract as to preclude the District from later taking over the job because of the contractor's unnecessary and unreasonable delay. Non-payment of a progress installment when due is waived by the contractor, as ground for cancelling the contract, unless cancellation is declared within a reasonable time after such default.

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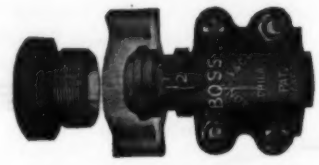

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Engineer Discusses Compaction of Soil

(*Continued from page 4*)

same soil when placed in 8-inch layers and given six passes with a fairly heavy sheepsfoot roller. While not minimizing the importance of the sheepsfoot roller, this experiment proves what a large percentage of the compaction was accomplished by the other equipment.

In the part of the article entitled "Effect of Tamping Rollers," there is a statement "Successive trips build up a dense layer at the bottom which increases in thickness until, on the final rolling, the feet ride on the surface". This can be misleading. There are combinations of soil, moisture and rollers where maximum density is obtained but where the feet will never ride out, no matter how many passes are made. With this condition, the weight and dimensions of the rollers can be changed so that they ride out after a given number of passes but the density obtained will not be maximum. For that reason, it is not necessarily true that maximum density is obtained when the feet ride out. The truth of this is further developed when one realizes that the maximum density occurs at a considerable depth below the surface and does not occur directly below the feet of the roller. At the present time, the relationship between a given soil, a desired density and the roller to use is a relationship which can be found by experiment only. Laboratory analysis and past experience can be guides but they can not take the place of an experiment with the actual size, weight and speed of the equipment to be used, whether this equipment be the sheepsfoot roller, the rubber-tired roller, the treads of track-type tractors, or merely the transporting equipment.

At the conclusion of the article, it is correctly suggested that many questions for discussion are brought up by this report. To this writer, they suggest the following summation:

1. We compact soil in order to make it denser and not primarily to control its moisture content; therefore laboratory findings regarding permeability, consolidation and angle of internal friction should be translated into density requirements in the field.
2. Density should be measured by actual volumetric weight tests of samples of compacted fill.
3. The part played by every single piece of equipment in obtaining the required density should be recognized.
4. As it is difficult, or in certain parts of the country impossible, to keep a fill at the "optimum moisture content", the amount of work done by the equipment should be varied within wide moisture limits so that the desired density may be obtained, both above and below as well as at the optimum moisture content. Economics will determine whether or not it is more desirable to give the fill more passes with the equipment or add or subtract water until the desired compaction can be obtained with the minimum amount of work.

It is self evident that this article is very valuable. Here's hoping the A.R.B.A. Committee follows it up with more of the same.

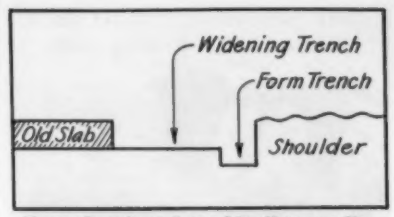
Very truly yours,
Howard F. Peckworth,
Senior Engineer, PWA,
Santee-Cooper Project, South Carolina.

Want information? Write the Editor.

Widening and Form Trench Dug at Once

The development of a new digging wheel for Buckeye road wideners which is designed to excavate trench for forms simultaneously with the excavation of subgrade widening trench has just been announced by the Buckeye Traction Ditcher Co., Findlay, Ohio. This simultaneous digging is accomplished by equipping each bucket on the digging wheel with two rooters which are somewhat larger and longer than the other rooters on each bucket, these longer rooters doing the deeper digging for the form trench.

All models of Buckeye road wideners can be equipped with these rooter teeth for preparing form trench. These wideners are available in three models: Model 16-R-2, for digging subgrade widening trench up to 33 inches wide in one cut; the 16-R-4, for digging trench up to 48 inches wide in one cut; and the 16-RD-4 equipped with a rear dump conveyor for carrying the excavated material to trucks following the machine. The other models discharge onto the shoulder. These units are designed to prepare a mile or more a day of accurate trench adjacent to old road surfaces, and are also used for excavations on the inner side of sharp curves.



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4. When unloading can operator control depth of spread? Is ejection a positive force system—not uncontrolled type?	YES
5. Will it pick up heaping loads in all types of materials? Is it designed to handle sand, rock, shale, mud—etc.?	YES
6. Is scraper cable controlled by a proven power unit? Has the Power Unit been proven by years of actual job use?	YES by over 16,500 LeTourneau Power Units
7. Are cables located so they will not wear in dirt? Has scraper been designed to protect cables from wear?	YES
8. Has scraper been proven by actual job performance? Was it built by earthmoving men who know job conditions?	YES — Over 8,000 other Carryalls now in use.
9. Will the scraper have a high trade-in or resale value? In future years will there be a market for your scraper?	YES—1st Carryall built still in use on West Coast.
10. Can you get parts and service any time . . . anywhere? Is the scraper backed by a well-trained organization?	YES—In over 100 U.S. cities and 30 foreign countries.

. . . NOW CHECK CARRYALL PERFORMANCE, by asking your LeTourneau-"Caterpillar" dealer for a demonstration right on your own job. Call him TODAY!

LETOURNEAU
PEORIA, ILLINOIS • STOCKTON, CALIFORNIA

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Here's a sure way to make substantial cost reductions on your hauling. Truck users in more than a score of industries report savings as high as 40% on investment, 30% on operating costs and 35% on upkeep expense.

SAVE ON ORIGINAL COST

You save on investment since instead of buying a big, heavy-duty truck you select a smaller unit of any standard make—one priced low as a result of mass production.

ADD A THORNTON DRIVE

Your nearby Thornton distributor will quickly add a Thornton Four-Rear-Wheel Drive—a correctly-engineered unit with all necessary reinforcements that become an integral part of your truck.

HAUL DOUBLE THE PAY LOAD

You'll have a truck that will easily haul more than twice the usual load and likewise assure better traction for hill, hole or soft ground. Thornton inter-axle two-speed transmission gives speed for the highway and big gear reduction for heavy pulling.

YOU SAVE IN EVERY WAY

First cost is far less than that of a conventional truck of equal capacity. Operating and upkeep costs are less. Speed and tractive effort are greater. Six-wheel braking provides greater safety. In fact, from every standpoint you'll save money and do a better job with a Thornton Drive. **Write today for complete story.**

THORNTON TANDEM CO.
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Manufacturers also of the THORNTON automatic-locking DIFFERENTIAL
"When you need TRACTION you need THORNTON"

C. & E. M. Photo

J. W. Ruth, Superintendent for the contractor (at left) and J. A. Tackett, Resident Engineer for the Kentucky Department of Highways.

Kentucky Grading In Shale and Rock

(*Continued from page 2*)

trucks. Because of the way the sandy loam and clay encountered on this job compacted and held its moisture, no laboratory equipment was used on the job during the first part of the operation. The action of the sheepsfoot roller in quickly packing the material and then riding the surface, indicating complete compaction, was considered as sufficient evidence of the proper moisture content together with the experience of the engineers in charge.

The fill immediately adjacent to the 50,000-yard cut was 1,800 feet in length and had a maximum height of 25 feet. When the rock was being placed an International TD-18 tractor with a Bucyrus-Erie bulldozer was used to complete the spreading of the material as uniformly as possible and particularly for pushing material over the edge where it was not safe for the large scrapers to operate too close for fear of damaging them.

Specially Prepared Detour

In order to care for the considerable volume of through-traffic which normally uses this road, the state provided a detour over 8 miles of state road, 9 miles of road recently built by WPA on new location, and 1 mile of highway which the state had to build specially to complete the detour as the WPA project had not been completed far enough to connect with a state road at the south end of the detour. The 8 miles of state road was already surfaced with crushed stone so that it was necessary to surface only 10 miles of road. This was done with slag from 1¼-inch down to ¼-inch material, putting the smaller material, 25 per cent of the total, on first to prevent the whipping out of the fines by traffic and also to prevent the larger material working into the subgrade.

Major Quantities

The major quantities on this project were as follows:

Unclassified excavation	285,578	cu. yds.
Overhaul (free haul 2,000 feet)	81,943	sta.-yds.
Water, for fill	14,000,000	gals.
18-inch reinforced concrete pipe	1,575	ft.
24-inch reinforced concrete pipe	1,221	"
30-inch reinforced concrete pipe	120	"
36-inch reinforced concrete pipe	126	"

In addition to these major quantities, there were three culverts of 20-foot or more span on the job which, according to Kentucky classification, places them in the category of bridges. One of these was a quadruple 8 x 9-foot box culvert 66 feet long and containing 342.3 cubic yards of concrete. Another was a triple 8 x 10-foot box culvert 95 feet long containing 428.8 cubic yards, while the third was a double 10 x 4-foot culvert 60 feet long containing 150.8 cubic yards of concrete.

Channel Change

A small stream running alongside the new fill adjacent to the 50,000-yard cut required a channel change to insure adequate area for the flow of water with the enlarged fill. In the course of drilling with the wagon drills for clearing the channel in rock, a rather interesting and humorous situation developed. The drill holes were placed in two rows, one somewhat higher in the bank than the other. The upper line was drilled 8 feet deep first and then the lower line was drilled to a similar depth, preparatory for shooting the two rows at the same time. When it came time to clean out one of the holes in the lower line by blowing, everyone was astounded to see water shoot out of the adjacent upper hole and nothing from the hole which was being cleaned. This phenomenon was not repeated with any other pair of holes.

Personnel

The contract for this Federal-Aid Project 78A(3)GS in Lawrence County was awarded to Ralph E. Mills Co. and Woods & Barton Co., of Frankfort, Ky., on their low bid of $352,110.68 which included the base and paving in addition to the grading described. For the contractor, J. W. Ruth was General Superintendent, and for the Kentucky Department of Highways, J. A. Tackett was Resident Engineer.

Two California Dams Ready for Service

The completion of Prado and Fullerton Dams in California has recently been announced by the Los Angeles District, U. S. Engineer Department. Prado, located in Riverside County at the upper end of the Santa Ana Canyon, is the largest and most important single item in the flood-control program for the improvement of the Santa Ana River Drainage Basin, and Fullerton Dam, considerably smaller from the structural standpoint, is of great importance to nearby residents who will now be protected from floods.

Prado Dam was designed by the U. S. Engineer Department, Los Angeles District, and constructed under contract by Prado Constructors, the total cost of the project, including rights-of-way and the relocation of the state highway and the Santa Fe Railroad, amounting to approximately $9,500,000. It is an earth-fill dam, 2,280 feet in length on the crest, a maximum height of 105 feet above the bed of the Santa Ana River, is 850 feet through the base, and 30 feet wide at the crest. It contains approximately 3,500,000 cubic yards of earth fill with a core of impervious material and a cut-off wall of steel sheet piling in the stream bed tied into reinforced-concrete keywalls at the abutments. This project required about 200,000 cubic yards of concrete and more than 11,000,000 pounds of reinforcing steel. The up-stream face of the dam is paved with hand-placed rock on a 6-inch course of crushed rock, with the rock paving grouted on the approach to the outlet works. It is designed solely to hold back flood waters and regulate the flow of the Santa Ana River below the dam, and has an impounding capacity of 224,500 acre-feet.

Among Prado's interesting features are the design and construction of the spillway cut through the southerly abutment, the top of which forms a small plateau at an angle of about 45 degrees to the axis of the dam. The spillway is of the overflow type with an ogee crest to insure that the stability of the dam will not be endangered by over-topping. The channel is 1,100 feet long and 1,000 feet wide at the crest, narrowing to 660 feet at the discharge end below the dam where a deep crib cut-off protects the abutment from erosion.

The contracts for the construction of Prado Dam were awarded on September 23, 1938, to W. E. Callahan Construction Co., Guthrie-Marsch-Peterson Co., Geo. W. Condon Co., and J. P. Shirley, known as Prado Constructors, and work was completed in May, 1941.

Like Prado, Fullerton Dam is also an earth-fill dam of rolled impervious earth, and will retard the flow of flood waters. The reservoir will have a maximum capacity of approximately 1,290 acre-feet, the total length of the dam at the crest is 620 feet and the height above the stream bed 45 feet. Charles U. Heuser of Glendale, Calif., was the contractor, starting work on May 25, 1940. The contract called for the completion of the dam by May 24, 1941, but it was completed about 30 days ahead of schedule. The total cost of the project, including rights-of-way, materials furnished by the U.S.E.D., contract costs, etc., was $425,000.

Here's why HEIL TWIN-CABLE SCOOPS UNLOAD FASTER—CLEANER —AND SAVE YOU MONEY ON CABLE REPLACEMENT COSTS

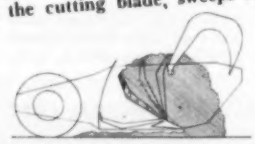
HEIL Tilting Floor Positive Push-Out Action exerts lower line pull on the discharge cable.

Heil CABLE CONTROLLED SCRAPERS unload faster and save you money — by eliminating the time lost during gear shifting that is required for unloading other Cable scrapers. When the operator drives onto the fill, he dumps the load at hauling speed — without the necessity of gear shifting — because the low line pull required to operate the Tilting Floor Push Out mechanism does not stall the tractor motor.

The tilting floor, hinged back of the cutting blade, sweeps sides and curved back end of the bowl clean as it dumps and pushes the load out of the bowl. The lever action which tilts the floor is a "generated" movement, starting with a low cable draft when the bowl is fully loaded and has a rapidly accelerating movement until the full dumping position is reached. Lower line pull is easier on the cables — and saves you money on cable replacement costs!

Heil Twin-Cable Scoops are available in 6, 8, 10, 12, 16, and 24 Yard capacities for use with any make of crawler tractor. Faster, easier unloading action is only one of the reasons for increased hourly yardage production and lower operating costs. Write, today, for full details.

(This is the First Advertisement in a Series. Watch for others explaining additional operating advantages of Heil Twin-Cable Scoops.)



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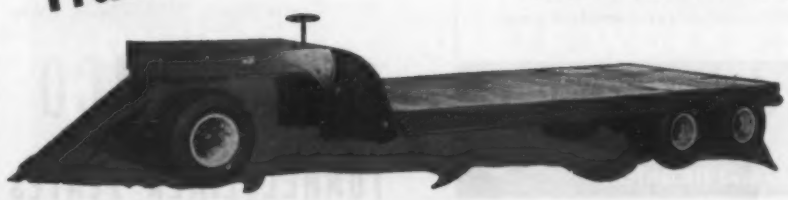

• You're going to buy a trailer! What kind of a trailer? A trailer at a price —without any reserve factor of safety? One that is going to give frame or axle trouble after only a few months' operation? . . . Or will you come to trailer headquarters and buy a trailer engineered for the job—a *Jahn* trailer! Get down to details and find out what you are buying. Jahn trailers have oversize beams. Brake cross shafts and radius rods have bronze bushings. Wheels are mounted on oversize roller bearings. Ample cross members and gusset plates give strength to resist twisting strains. Goosenecks on each trailer are individually designed and constructed to meet required strength. Mechanical brakes, loading ramps, lash rings, safety chains, reflectors and flag sockets are standard equipment. There are no extras. These are only a few of the things that are standard on Jahn trailers. It costs nothing to ask, and we can help you.

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Southern California Distributors for

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NOVO—Engines, Pumps, etc.
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OWEN—Clamshell Buckets
RANSOME—Concrete Mixers, Pavers, etc.
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GAR-BRO—Dragveyor Attachment for Draglines

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Asroil Emulsion Distrs.
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"Berg" Concrete Surfacers
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Carlson Bit Grinders
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Dobbie Derricks, Fittings
Erie Rollers
Gar-Bro Barrows, Carts
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Huber Rollers
Interstate Tramways
Jackson Concrete Vibrators
Jaeger Mixers, Pumps, Hoists, Paving Equip.
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Kissler Clamshell Buckets
Kohler Lighting Plants
Littleford Wheeled Rollers
McKiernan-Terry Pile Hammers
Marion Shovels, Cranes, Draglines
Nelson Bucket Loaders
Ohio Locomotive Cranes
Page Dragline Buckets
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Ramsey Winches
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"Thor" Air Tools
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NORTHERN CONVEYOR CO.—Stationary & Portable Conveyor Units
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SNOW REMOVAL EQ. CO.—Rotoblade & Sierra Snow Plows
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Chicago Pneumatic—Compressors, Drills, Breakers, Pneumatic and Electric Tools
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Haiss—Loaders, Conveyors, Buckets
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Jones & Laughlin—Gilmore Wire Rope
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Northwest Engineering Co.—Gasoline Cranes, Shovels and Draglines
Ord—Road Finishing Machine
Ransome Concrete Machinery Co.—Concrete Mixers and Appliances

Member: Associated Equipment Distributors

HOWARD W. READ CORP.

N. W. Cor. 25th and Wharton Sts.,

Philadelphia, Pa.

Distributors

Ralph B. Carter Co.	Quick-Way Truck Shovel Mfg. Co.
Ingersoll-Rand Co.	Vulcan Iron Works, Inc.—Pile Hammers
Insley Mfg. Co.	
Koehring Co.	

Also Carry in Stock:

Hoisting Engines, Gas and Steam

HAVE YOU CHANGED YOUR LOCAL ADDRESS?

Sometimes in the rush of moving to a new location you fail to send us your new address. And as we are anxious to get your copy of the magazine to you on time do not put off writing us. Thank you.

CONTRACTORS AND ENGINEERS MONTHLY

470 Fourth Ave. New York

New Dealers Appointed For Hercules Rollers

The Hercules Co., Marion, Ohio, announced recently the appointment of three new distributors of the Hercules Ironeroller. These are the Petrie Machinery Co., 501 No. Broadway, Billings, Mont.; H. P. Kelly Equipment Co., 2101-15 Florence Ave., Cincinnati, Ohio; and the Empire Equipment Co., 824 No. Main St., Sioux Falls, So. Dak.

Our Army's on Wheels!

The importance of highways in the National Defense Program is illustrated rather forcefully by the fact that the U. S. Army owned, in the latter part of April, 190,000 motor vehicles as compared with 14,000 only two years ago. By late summer or early autumn, a goal of 286,000 will be reached, the number now considered necessary for an army of 1,400,000 men, according to an item in *Highway Research Abstracts.*

FOR YOUR

Calcium Chloride

NEEDS

WRITE or WIRE:

MICHIGAN ALKALI COMPANY

General Sales Office: 60 E. 42nd St., New York, N. Y. Plants: Wyandotte, Michigan

SERVICE SUPPLY CORPORATION
20th and Venango Sts., Philadelphia, Pa.
Representing
Bay City Shovels, Inc.—Shovels, Cranes, etc.
Beach Mfg. Co.—Saw Rigs
Chicago Pneumatic Tool Co.—Compressors, Air Tools
W. F. Hebard & Co.—Shop Mules
Hercules Company—Road Rollers
Internat'l Harvester Co.—Indus. Wheeltype and Crawler Tractors
Jaeger Machine Co.—Mixers, Truck Mixers, Pumps, Black Top Pavers, Finishing Machines
C. S. Johnson & Co.—Blns, Batchers, Cement Handl. Eq.
Lambert-National—Hoists
Littleford Bros.—Road Oil Distrs. Heating Kettles, etc.
McKiernan-Terry Corp.—Pile Hammers
N. P. Nelson Iron Wks., Inc.—Loaders & Belt Conveyors
The Parsons Company—Trench Machines, Snow Plows
Pioneer Engineering Wks., Inc.—Roll Crushers
Silent Hoist Winch & Crane Co.—Krane Kars, Winches, Capstans, Car Pullers, etc.
Member: Associated Equipment Distributors

J. JACOB SHANNON & CO.
1744—Sedgley Avenue—1744
PHILADELPHIA
Representing
Baker Mfg. Co.—Bulldozers, Blade & V Type Snow Plows
Burch Corp.—Snow Plows, Maintainers
C. H. & E. Mfg. Co.—Saw Rigs, Rollers, Hoists
Clyde Iron Wks., Inc.—Gas, Elec., Steam Hoists
Concrete Surfacing Machinery Co.—Berg Surfacers
Electric Tamper & Equipment Co.—"Jackson" Vibrators
Exnick Machy. Co.—Plaster Mixers
Gardner-Denver Co.—Air Compressors
Gilson Brothers Co.—Conc. Mixers
Huber Mfg. Co.—Road Rollers
Joy Mfg. Co.—Snow Loaders
Link-Belt Speed-o-Matic Shovels, Cranes, Draglines
Ransome Concrete Machy. Co.—Truck Mixers
Richmond Screw Anchor Co.—Form ties
W. A. Riddell Corp.—Road Graders
John A. Roebling's Sons Co.—Wire Rope, Fittings
Sasgen Derrick Co.—Derricks and Winches
Shannon—Derricks and Derrick Fittings
Sterling Machy. Corp.—Pumps, Hoists, Generators
Van Dorn Iron Works Co.—Sweepers
Member: Associated Equipment Distributors

WESTERN MATERIAL CO.
Aberdeen, Sioux Falls, Rapid City, S. D.
Allsteel Prod.—Pipelines
Athey—Wagons
Balderson—Snow Plows
Bates—Wire Ties
Broderick & Bascom—Rope
Butler—Bins, Hoppers
Philip Carey—Exp. Joint
"Caterpillar"—Equipment
Chain Belt—Pumps, Mixers
Clyde—Hoists
Cuming—Hoists
D-A—Lubricants
Day—Crushers
Grace—Road Sweepers
H'wy Safety—Reflect. Markings
H'way Trailer—Earthboring Eq.
Killefer—Road Equipment
Kob—Spreaders
LaPlant-Choate—Tractor Eq.
LeTourneau—Dirt-Moving Eq.
Littleford—Markers, etc.
LeRoi—Gas Engines
Manhattan—Belting
Rockwood—Pullers
Rotary—Snow Plows
Sasgen—Derricks
Stockton-McLean—Scrapers, Fresnos
Speeder—Shovels
Sterling—Wheelbarrows
Surestop—Traffic Signs
Templeton-Kenly—Jacks
Universal—Crushers
Western Cataphote—Signs
Wiard—Plows
Williamette Hyster—Winches
Winslow—Scales
Wood—Shovels
Member: Associated Equipment Distributors

NIXON-HASSELLE COMPANY, INC.
Contractors' Equipment
Chattanooga Tennessee
Representing
Archer Towers, Spouting Equipment
Austin-Western Graders, Crushers, Rollers, Scrapers, etc.
Blaw-Knox Batchers, Buckets, Forms, etc.
Bros Tank Car Heaters, etc.
Buoyrus-Erie Bullgraders, etc.
Dobbie Derricks
Four Wheel Drive Trucks
Haiss Loaders, Conveyors, etc.
Hough Road Sweepers, Sprinklers, etc.
Murphy Diesels
Ingersoll-Rand Compressors, Jackhammers, Air Tools, etc.
International TracTracTors, Wheel Tractors & Power Units
Jahn Machinery, Trailers
Lidgerwood Hoists, etc.
Maslind Asphalt Kettles
Mall Vibrating Equipment, Saws, etc.
Newport Culvert Pipe
Northwest Cranes, Shovels
Rex Mixers, Pavers, Pumps, etc.
Timken Detachable Bits
Vulcan Gas Locomotives
Also Wheelbarrows, Carts, Benders, Cutters, Shovels, etc.
Member: Associated Equipment Distributors

BROOKS EQUIP. & MFG. CO.
Knoxville 408 Davenport Rd. Tennessee
Representing
J. D. Adams Co.
Buckeye Traction Ditcher Co.
Buoyrus-Erie Co.
Burch Corp.
Construction Machy. Co.
Crucible Steel Co.
Davey Compressor Co.
Euclid Road Machy. Co.
Federal Motor Truck Co.
Frank G. Hough Co.
Hercules Co.
Independent Pneu. Tool Co.
International Harvester Co.
C. S. Johnson Co.
Linn Mfg. Corp.
N. P. Nelson Iron Works
Manhattan Rubber Mfg. Div. of Raybestos - Manhattan, Inc.
Pioneer Engrg. Wks., Inc.
Rasco Mfg. Co.
T. L. Smith Co.—Truck Mixers
Upson-Walton Co.
Member: Associated Equipment Distributors

OSBORNE EQUIPMENT COMPANY
525 State Street, Knoxville, Tennessee
Distributors for
American Cable Div., American Chain & Cable Co., Inc.
Boston Woven Hose & Rubber Co.
Butler Bin Co.
Davenport Besler Corp.
Galion Iron Works & Mfg. Co.
Gardner-Denver Co.
Hug Co.
Iowa Mfg. Co.
Jaeger Machine Co.
Jeffrey Mfg. Co.
Northwest Engr. Co.
Owen Bucket Co.
Pomona Pump Co.
Skilsaw, Inc.
Member: Associated Equipment Distributors.

WILSON-WEESNER-WILKINSON CO.
Nashville Tennessee
Representing
Allis-Chalmers Mfg. Co.
Ames Baldwin Wyoming Co
Baker Mfg. Co.
Blaw-Knox Co.
Cleaver-Brooks Co.
Clyde Iron Works, Inc.
E. D. Etnyre Co., Inc.
German-Rupp Co.
Ingersoll-Rand Co.
Insley Mfg. Co.
Koehring Co.
Littleford Bros.
Master Vibrater Co.
The Parsons Co.
Smith Engineering Works
Gar Wood Indus., Inc.
NASHVILLE—KNOXVILLE
Warehouse Stocks of Service
Reinforcing Steel and Mesh
Member: Associated Equipment Distributors

BROWNING-FERRIS MACHY. CO.
205 Exposition Ave. Dallas, Texas
Texas at Rice Sts. Houston, Texas
Representing
Cleveland Trencher Co.
Foote Company—Pavers
Galion Iron Works & Mfg. Co.
Buoyrus-Erie—Scrapers, Bullclamers
Ingersoll-Rand Company
International—Tractors
Iowa Mfg. Co.—Cedar Rapids Line
Jaeger Machine Company
Jones Superior Mach. Co.
Littleford Brothers
The Owen Bucket Company
Page Engineering Co.
Sterling Wheelbarrow Co.
Thew Shovel Company
Traskson Company
Member: Associated Equipment Distributors

R. B. EVERETT & CO.
3112-18 Harrisburg Blvd. Houston, Texas
BLAW-KNOX Road Plant Equipment, Bins, Clamshell Buckets
AMERICAN Hoisting Machinery
"P. & H." Gasoline Cranes
McKIERNAN-TERRY Pile Hammers, etc.
CONNERY Asphalt Equip.
CHAIN BELT Concrete Mixers, Saw Rigs, Pavers
NOVO Engines, Hoists, Pumps
"RED STAR" Wheelbarrows
SAUERMAN Cableways
BATES Wire Ties
PULSOMETER & NYE Steam Pumps
PATENT Safety Swinging Scaffolding
TRU-LAY Wire Rope
BUFFALO-SPRINGFIELD Road Builders
SULLIVAN Compressors
PORTABLE Conveyors
ETNYRE Asphalt Distrs.
FLYNN Surgrader
PAGE Dragline Buckets
MALL Vibrators
Member: Associated Equipment Distributors

PHILLIPS MACHINERY CO.
900 East Cary St. Richmond, Va.
Representing
Aeroil Burner Co., Inc.
Austin Machinery Corp.
Broderick & Bascom Rope Co.
Butler Bin Company
Chain Belt Company
Clyde Iron Wks., Inc.
Concrete Surfacing Machy. Co.
Independent Pneumatic Tool Co.
Jackson Mfg. Co.
Manitowoc Engineering Works
Master Vibrator Company
Rogers Brothers Corp.
Sasgen Derrick Co.
Sauerman Brothers, Inc.
Skilsaw, Inc.
Stephens-Adamson Mfg. Co.
Vulcan Iron Works
Member: Associated Equipment Distributors

CONSTRUCTION EQUIPMENT CO.
1118-1124 Ide Ave., Spokane, Wash.
Aeroil Burner Co., Inc.
Archer Iron Works
Bates Wire Ties
Beebe Bros.
Blystone Mfg. Co.
Broderick & Bascom Rope
Buoyrus-Erie Co.
Davenport Besler Corp.
Galion Iron Works & Mfg. Co.
Gardner-Denver Co.
Hug Co.
Iowa Mfg. Co.
Jaeger Machine Co.
Jeffrey Mfg. Co.
Northwest Engr. Co.
Owen Bucket Co.
Pomona Pump Co.
Skilsaw, Inc.
Homestead Valve Mfg. Co.
Kalamazoo Ry. Supply Co.
LeRoi Co.
The Linde Air Products Co.
M. & M. Wire Clamp Co.
Mall Tool Co.
Niagara Mfg. Co.
Red Star Products Co.
Sasgon Derrick Co.
Sheldon Mfg. Co.
Sterling Machinery Corp.
Sterling Wheelbarrow Co.
Sullivan Machinery Co.
Sunbeam Mfg. Co.
Templeton, Kenly & Co.
Williamette Hyster Co.
"Williams" Buckets, etc.
Young Iron Works
Member: Associated Equipment Distributors

BOEHCK EQUIPMENT CO.
2404 W. Clybourn St. Milwaukee, Wis.
Representing
American Hoist & Derrick Co.
Byers Machine Co.
Centaur Co.
Concrete Surfacing Machy. Co.
Electric Tam. & Equip. Co.
Hauck Mfg. Company
Hercules St. Products Co.
Huber Mfg. Co.
Iowa Manufacturing Co.
Independent Pneumatic Tool Co.
Jaeger Machine Co.
C. S. Johnson Company
Jones-Superior Machine Co.
LeRoi Co.
A. Leschen & Sons Rope Co.
Lima Locomotive Works
McKiernan-Terry Corp.
N. P. Nelson Iron Wks., Inc.
Portable Machinery Company
Red Star Products, Inc.
Rogers Bros. Corp.
Sasgen Derrick Co.
Superior Concrete Accessories, Inc.
Union Fork & Hoe Co.
Union Metal Mfg. Co.
Walker-Turner Co., Inc.
Wellman Engineering Co.
Member: Associated Equipment Distributors

CUNNINGHAM-ORTMAYER CO.
429 W. Michigan St. Milwaukee, Wis.
Blaw-Knox Truck Mixers
Butler Bins, Batchers
C.H.&E. Pumps, Hoists, Saw Rigs
Case Tractors and Mowers
Cleveland Formgrader Paving Equipment
"DowRake" Calcium Chloride
Eagle Crushers
Flexible Road Joint Machines
Flexible Sewer Cleaning Equipment
Galion Iron Graders, Rollers and Spreaders
Good Roads Snow Plows
Handlan 100-Hour Lantern, Torches
Heltzel Steel Road Forms
Ingersoll-Rand Air Compressors, Tools
Insley Power Shovels, Conc. Towers & Buckets
Koehring Conc. Mixers, Cranes, Shovels, etc.
Kwik-Mix Conc. Mixers
Littleford Distributors, Tar Kettles, Heaters
Multiplex Conc. Block Eq.
Omaha Dragline Buckets
Owen Clamshell Buckets, Grapples
Pasasho Spray Painting Equip.
Parsons Trenchers
Roth Conc. Vibrators
Sterling Wheelbarrows
Tuthill Hwy. Guard Rail
Wenzel Tarpaulins
Wire Rope Corp. of America
Woolridge Scrapers
Member: Associated Equipment Distributors

WE WOULD LIKE TO HAVE YOU HELP US

keep this Directory of Dealers in construction equipment up to date. Therefore, we would greatly appreciate any suggestions or corrections that you may have to offer.

CONTRACTORS AND ENGINEERS MONTHLY
470 Fourth Ave. New York

HUNTER TRACTOR & MACHY. CO.
327 So. 16th St. Milwaukee, Wis.
Exclusive Distributors
Aeroil Burner Co.
American Steel & Wire Co.
Barco Mfg. Co.
Bates Valve Bag Corp.
Beebe Bros.
Blaw-Knox Co.
Buckeye Traction Ditcher Co.
Buffalo-Springfield Roller Co.
Chain Belt Company
Clyde Iron Works, Inc.
Dempster Bros., Inc.
Kelley Electric Mach. Co.
Master Vibrator Co.
Northwest Engrg. Co.
R-B Equipment Co.
Sasgen Derrick Co. (open account)
Sauerman Bros., Inc.
Silent Hoist Winch & Crane Co.
Sullivan Machy. Co.
Syntron Co.
Universal Form Clamp Co.
Vulcan Iron Works
Member: Associated Equipment Distributors

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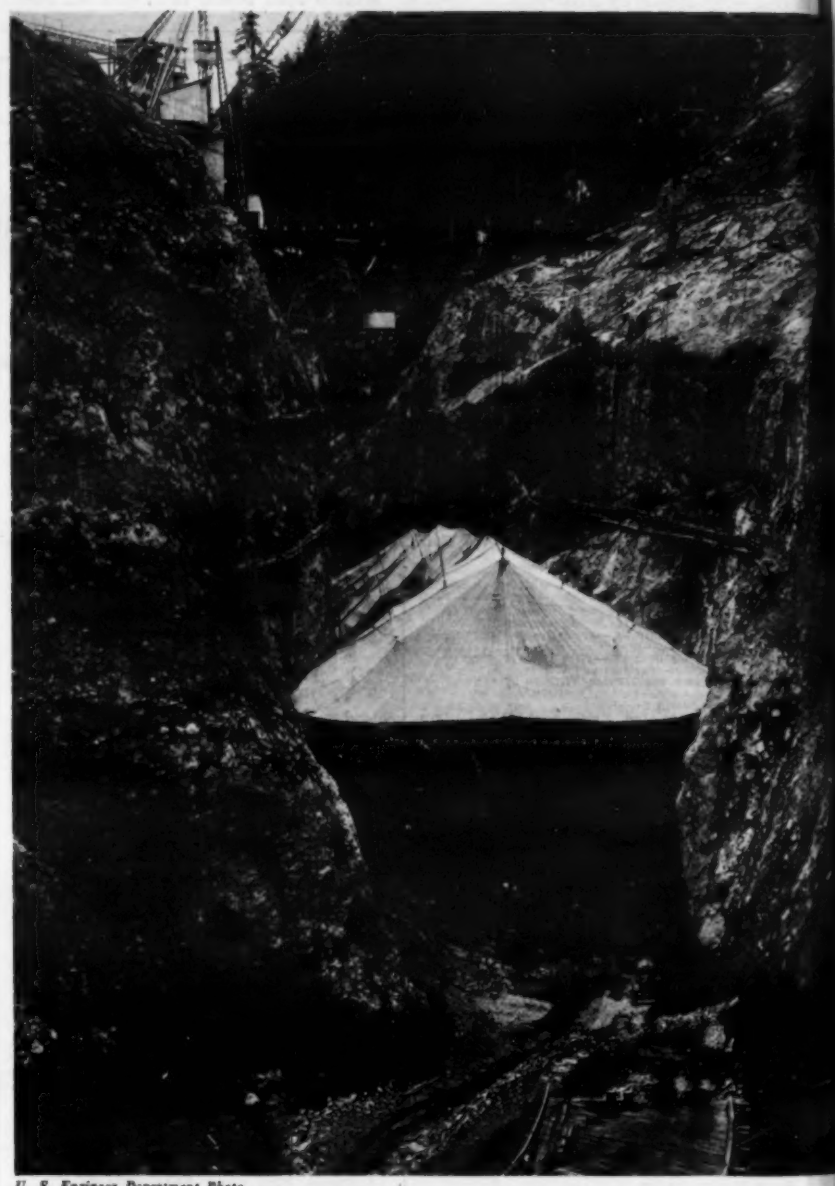
Contractors and Engineers Monthly

Two views of road-mix operations on Connecticut Route 10 in the towns of Simsbury and Granby with a Jaeger Road Builder pulled by a Linn tractor. See page 6.

A general progress view of the work at Loyalhanna Dam, a 760-foot concrete dam in Pennsylvania. See page 1.

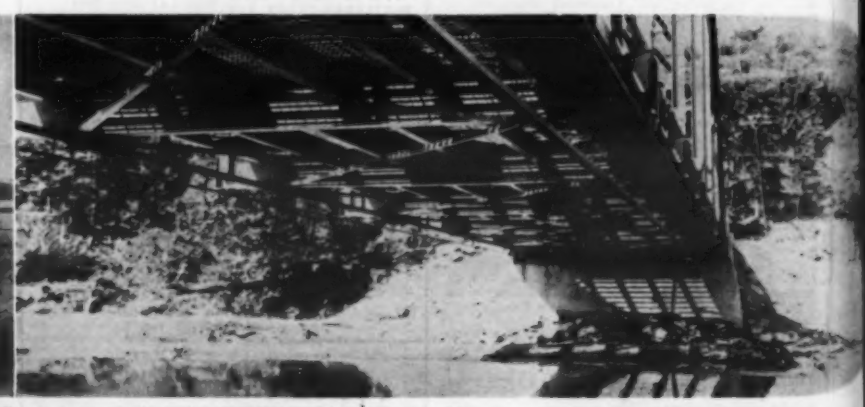
C. & E. M. Photo

Tank trucks for water eliminated water-line problems on Hechler Bros. concrete-paving job in Virginia. See page 15.



U. S. Engineer Department Photo

Work at Mud Mountain Dam, Washington, goes on under the giant tent to keep the core material dry. See page 39.



The Fairview Bridge at North Woodstock, N.H., a new steel arch structure replacing an old covered bridge and, at the right, the open steel grid flooring of the bridge. See page 1.